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ILLUSTRATIONS.

Church of St. Mary, Wandsworth.—Mr. E. W. Mountford, F.R.I.B.A., Architect ..... *Double Page Ink-Photo.*
Design for St. John's Church, Whittington, Salop.—By Mr. F. B. Wade, F.R.I.B.A. ..... *Two Single Page Ink-Photo's.*
Church, Falkland Grove, Dorking.—Mr. F. A. Walters, F.S.A., Architect ..... *Single Page Ink-Photo.*
Design for a Moorland Church, with Sunday School, &c.—By Mr. Banister F. Fletcher, A.R.I.B.A., Architect ..... *Single Page Ink-Photo.*
Competition Design for Cockington Church, Devon.—By Messrs. Tait & Harvey ..... *Double Page Ink-Photo.*

Blocks in Text.

Old "Swede's Church," Wilmington, Delaware.—From Sketches by Mr. E. Eldon Deane ..... Page 186
Old Farmhouse, Eastchester, N.Y. ..... ,, 188
Diagram, Syke's Interceptor ..... Page 156
Plan, St. Mary's Church, Summerstown, Wandsworth ..... Page 189
Plan, Proposed Church, Whittington, Salop ..... ,, 190
Diagrams illustrating "Student's Column" ..... ,, 193

CONTENTS.

Some Recent Books on Sewage Disposal 181
Notes 184
Holy Trinity Church, Wilmington, Del. 187
The Hygienic Congress at Budapest 187
Old Farm-house near New York 188
Competitions 188
The Trades' Union Congress 189
St. Mary's, Wandsworth 189
Proposed Church of St. John, Whittington 189
St. Joseph's Church, Dorking 189
A Moorland Church 189
Cockington Church, Devon 189
Books: P. E. Newberry's "Beni Hasan"; G. L. Gomme's "The Gentleman's Magazine Library"; T. L. Worthington's "The Dwellings of the Poor"; A. J. Wallis-Tayler's "The Sanitary Arrangement of Dwelling-houses"; J. P. Allen's "Practical Building Construction"; H. Adam's "Building Construction"; C. R. Ashbee's "A Few Chapters on Workshop Reconstruction and Citizenship" .. 190
Proposed Catholic Cathedral at Westminster 192
Pictorial Architecture 192
Lithographic Materials 192
Student's Column: Details of Rural Water Supply.—XI. 192
General Building News 19
Sanitary and Engineering News 194
Foreign and Colonial 195
Miscellaneous 19
Meetings 196
Recent Patents 196
Some Recent Sales of Property 197

Some Recent Books on Sewage Disposal.

ALTHOUGH England awoke to the necessity of considering the questions of sewerage and sewage disposal only about fifty years ago, there is some satisfaction in knowing that she was, after all, the first to undertake in earnest the Augean labour. Our American cousins lay claim to superiority and to priority in a great many matters, but in this, at least, they are willing to yield us the honours. Our right to them is gracefully admitted by the authors of a new American book on sewage-disposal;* "It is cheerfully conceded," the authors say, "inasmuch as the necessity for sewage purification first arose abroad, that consequently the foreign engineers had the opportunity to attack the problem first, and we may very properly profit by their experience." They began to profit by this experience as long ago as 1855, when the Chief Engineer of Chicago was sent to England to learn "whatever new or useful had been developed under the active agitation of sanitary questions which then prevailed in England." And they have continued to profit in the same way up to the present time. The book under consideration is further evidence of the fact, for a great part of it consists of abstracts and quotations from British sources. The Reports of Royal Commissions, the journals of our learned societies, and the books of English sanitarians, have all been freely drawn upon. But to this, it must be said, a great mass of indigenous American information has been added. The candour of the authors in acknowledging their indebtedness to previous inquirers, and the honourable way in which they quote their authorities, at once win the reader's favour. The following words of the preface give an idea of the nature of the book, while at the same time they exhibit the authors' frankness and modesty:—

> It will be noticed that the amount of original matter in the book is relatively small. This is partially owing to the use of the language of the authorities drawn upon, instead of veiling its identity under slight verbal changes. . . . In all cases the aim has been to present as clearly and yet as briefly as possible the best available information on the subject under discussion, and to indicate the sources of information. . . . We have assumed, in short, that the making of the ideal sewage-disposal manual is to some extent a matter of discreet editing.

Opinions may perhaps differ as to the manner in which some of the editing has been done, but every reader of the book will gratefully acknowledge the value of the large mass of information which the authors have collected. They have ransacked the journals of learned societies, and the reports of scientists, as well as books on all manner of subjects, from pisciculture to the construction of siloes. Very little indeed seems to have been overlooked. The latest authorities on the various branches of the question are quoted or referred to, and to complete the usefulness of the book in this direction lists of papers, pamphlets, and books are given in which the student will find further information on most of the points connected with sewage and its disposal.

But the very bulkiness of the information collected by the authors has proved a source of difficulty to them. The material has accumulated to such an extent that, like sewage-sludge, it cannot easily be disposed of. Here and there we find evidence that the authors have suffered from plethora of information; they have received more than they could assimilate, and lack of order and of perspicuity is the result. For instance, Chapter VI., entitled "Legal Aspects of the Case," is sandwiched between two chapters on "The Composition of Sewage Muds" and "Quantity of Sewage and Variation in Rate of Flow." The important subject of "Nitrification and the Nitrifying Organism," which ought to have been considered as a "first principle" or in connexion with irrigation or filtration, is preceded by a chapter on the discharge of sewage "into tidal or other large bodies of water," and followed by one on "Chemical Precipitation." The self-purification of running streams is discussed in no less than three different chapters, which also contain information on subjects as far apart as the sources of river-pollution and the money value of sewage, protective legislation, and the effect of sewage on sea fisheries. Again, Part I of the book is entitled "Discussion of Principles," while Part 2 contains "Descriptions of Works," and yet we find that the plan and description of the Boston Main Drainage are given in Chapter IX., and that the chief examples of the treatment of manufacturing-refuse are described and illustrated in Chapter XVI., both in Part I. Other instances of disorder could be given, but we have quoted enough to illustrate our point. It may perhaps be urged that these are trifling or inevitable lapses. We do not agree with this view. They are not inevitable, for technical books on subjects perhaps equally abstruse and intricate can be found (few in number, doubtless), which are both lucid and orderly. They are not trifling, because the reader's attention is distracted by this repeated flitting from one subject to another and back again, and a thorough grasp of the whole is therefore attainable only with much difficulty.

The book, large as it is, has its limitations. "I. The use of privies and cesspools, II. Collection by pail systems, III. The pneumatic systems of Liernur, Berlier, Shone, and others," are not considered at all, "except that a short chapter is included in Part II., descriptive of the pail system at Hemlock Lake, N.Y."; IV. Simple subsidence or sedimentation; and V. Simple filtration* through some artificial substance, as coke, excelsior, or ashes," are not considered "any further than as useful adjuncts to the more positive systems of purification. Experience in England has amply demonstrated that they have little claim to be considered systems of purification by themselves." There remain for consideration, then, according to the author's classification, five methods of sewage disposal, namely:—

> "VI.—Discharge of crude sewage into tidal or other large bodies of water.
> VII.—Chemical precipitation.
> VIII.—Broad irrigation.
> IX.—Intermittent filtration.
> X.—Electrolysis."

Electrolysis, however, which, according to the authors, "while promising good results, must still be considered as in the experimental state," does not appear to have been tried in America except on a very small scale indeed,† and, presumably in con-

* "Sewage Disposal in the United States." By George W. Rafter, M.Am.Soc.C.E., and M. N. Baker, Ph.B., Associate Editor *Engineering News*. New York: D. Van Nostrand Company. London: Sampson Low, Marston & Company, Limited. 1894. Pp. xxvii., 598; 111 tables, 7 plates, and 116 illustrations in the text. [The preface, we may add, is dated June 1, 1893.]

* It should be explained that by "simple filtration" the authors mean "simple *straining*"; the subject of *filtration* through land and artificial filters occupies considerable space in the book, and is illustrated by reference to the extremely valuable experiments carried out for the Massachusetts State Board of Health four or five years ago.

† At Brewsters, a village of about thirty-five buildings, fifty-two miles from New York, an electrical treatment is in operation. It differs considerably from Webster's Electrolysis, which was tried at Crossness, and which has since proved so efficient in the well-known Salford trials. These trials are not mentioned by Messrs Rafter & Baker.

sequence of this, it also is eliminated from consideration. The book therefore resolves itself into a discussion of the other four methods of disposal. Although the authors make no mention of it in their classification, a variety of broad irrigation should be mentioned (namely, sub-surface irrigation), seeing that a whole chapter (rather more than *one* page in length, be it said), is specially devoted to it, while three or four more pages are occupied with the description of its practical application at Lenox, Mass., and at the Lawrenceville (New Jersey) School for Boys.

As we have already pointed out, the book is divided into two parts: I. "Discussion of Principles," and II. "Description of Works." This is the arrangement previously adopted in a well-known English book, of which a second edition has just been issued.* In this, Part I. contains "General Details," while Part II. is styled "Sewage Disposal Works in Operation." In the American book the description of works occupies rather less half the volume, in the English book rather more than half. As the American book, however, contains more than twice as much matter as the other, really more space in it is devoted to the description of works than in Mr. Crimp's book. Indeed, this American volume is a *magnum opus;* and in the space of one article it would be impossible to discuss the whole of the matters of which it treats. We have already indicated the general scope of it, and can only add the barest summary of its contents, together with a few comments on the main conclusions at which the authors have arrived.

Before entering upon a discussion of the actual methods of disposal, the authors rightly essay the consideration of the first principles of the subject. A short statement of the germ-theory of disease is illustrated by a long reference to typhoid fever and to various epidemics of that disease, but particularly to those at Lawrence, Massachusetts. An experiment made in connexion with this outbreak revealed the fact that typhoid bacilli of the sturdiest sort would live for three weeks, even in water kept nearly at freezing-point. This period would suffice for a stream, flowing only a mile an hour, to carry the germs about 500 miles. It is matter for congratulation, however, that in a running stream various causes, such as minute animals and plants, operate to prevent the pathogenic bacilli from attaining the undesirable longevity which they enjoyed in the experimental bottle.

The infectious diseases of animals and their relation to the diseases of human beings form the subject of the second chapter; but the communication of diseases by the milk of cattle which have drunk polluted water is not dwelt upon. This is followed by various reports on river-pollution, prepared at the instance of several State Boards of Health, Massachusetts being the first and the most consistent labourer in this respect. A valuable report was, however, made to the Connecticut Board in 1886 by Professor Williston, of Yale College, and his copious descriptions of various manufacturing processes and their refuse are quoted in full.

Chapter IV. is a hodge-podge of ingredients of various values—the self-purification of a running stream from the biological point of view, the manurial constituents of sewage, the money value of sewage, sewage-disposal works "not properly subject to franchise by private companies," the rational view of disposal into tide-water and fresh-water, &c. The most important part of the chapter is that devoted to the purifying action which minute animals and plants exert in streams, and the most important contribution to this discussion is a long extract from Dr. H. C. Sorby's valuable paper in the *Journal* of the Royal Microscopical Society for 1884. Dr. Sorby's experiments led him to the conclusion—

> That when the amount of sewage discharged into a river is not too great, it furnishes food for a vast number of animals who perform a most important part in removing it. On the contrary, if the discharge be too great, it may be injurious to them and this process of purification may cease.

The authorities of English towns have for ages had a childlike faith in the self-purifying powers of running streams. Their faith was somewhat shaken when the Rivers Pollution Commissioners wrote their memorandum on the Calder at Dewsbury with the river water instead of ink; but faiths die hard, and to-day there are hundreds of towns and villages which still cling to the old idea. The less faith that is put in the self-purifying power of a stream, the better will it be for the health and comfort of all who draw their water-supply from it or who reside near its banks.

Biological researches have thrown a wonderful light on the causes of the purification effected not only in water but also in soil and filters. The fact that a filter of coarse sand, treated at intervals with doses of crude sewage, will purify the sewage to a considerable extent, and at the same time remain clean itself for years, was inexplicable until the promulgation of the biological theory. The nitrification of sewage in soils, with which the name of Mr. Warington will always be associated, also depends on an innumerable company of these micro-organisms, intent on converting the dangerous organic impurities into harmless nitrates. This new theory of sewage-purification is fully explained in Messrs. Rafter & Baker's book by copious extracts from the writings of English scientists, and also from a long and interesting report prepared by Edwin O. Jordan and Ellen H. Richards, and presented to the Massachusetts State Board of Health in 1890.

Among the other preliminary matters treated of are the composition of sewage muds, and the quantity of sewage and the variation in rate of flow. Tables are given showing the average daily consumption of water in 195 cities of the United States. The quantity used per head is on the average considerably in excess of the amount used in England, and this is one reason why American sewage is so much weaker than English. The heaviest recorded rainfalls at various cities in the States are tabulated, and the difficult question of storm-water is discussed. The authors' opinion is—

> "That in the great cities the quantity of water derived from the rainfall is so great that to hold it in storage and treat it becomes a practical impossibility. As a compromise, then, we could only hope to provide for treating the first flow of rain-water, which, as containing the bulk of the street-washings, may be looked upon as the most important. In this view we would provide for, perhaps, 5 to 10 per cent. of the maximum twenty-four hours' rainfall."

Taking all things into consideration, the authors come to the conclusion that :—

> "When some form of purification is to be provided, a separate system of sewerage appears preferable to the combined system by reason of not only the greater ease with which the more uniform flow of the separate system can be treated, but also by reason of the materially reduced expense of such treatment."

This opinion is shared by most, if not all, English sanitarians, but the initial cost of separate sewers has prevented their complete adoption, except in comparatively few cases. In many towns, however, new streets are being sewered on the duplicate system, and in this way the increase of storm-water in the sewers is prevented. Mr. Santo Crimp, while in favour of the separate system, considers that it will generally be necessary "to take the drainage from the backs of the houses and from back-yards into the sewage sewers."

Chapter VIII. of Messrs. Rafter & Baker's book reminds us of the *puchero* pot of a Spanish housewife. Stray information on a great variety of topics has been thrown into it, and labelled, "General Data of Sewage Disposal." It would be interesting to quote the fifteen heads under which this information is presented, as a further example of the authors' lack of order, but it must suffice to say that they range from "Sewerage-systems—Separate or Combined," to "The Composition of London Sewage," and from "The Data of Human Excrements," to "Quality of Material required for Intermittent Filtration." This chapter completes the discussion of what we have called the "first principles" of sewage-disposal, and leaves the way clear for a general exposition of the four chief methods of disposal to which we have already alluded.

The first method—"*Discharge of sewage into tidal or other large bodies of water*"—is illustrated by reference to the difficulties experienced at Chicago, where the sewage is turned into Lake Michigan, and to the success at Boston, the sewage of which is conducted to Moon Island (about 2½ miles from the city), and there poured into the sea at the ebb of the tide.

The second method is that of *Chemical Precipitation*, to which probably more thought and ingenuity has been devoted by sanitarians than to all the other methods put together. Patents almost innumerable have been taken out by sanguine inventors, in hopes to solve the sewage problem once for all by some magical precipitant. Mr. Slater, in his book on "Sewage Treatment, Purification and Utilisation," mentions several hundreds of patents relating to the chemical treatment of sewage. Mr. Santo Crimp describes twelve methods which have been adopted in England, while another recent writer, Mr. Thomas Wardle, whose book* we have received, describes sixteen methods. Very few indeed of the numerous systems have been of sufficient merit to insure more than an ephemeral existence; but, on the other hand, there are undoubtedly in England to-day several methods in use which go a long way towards clarifying and deodorising the sewage, even although they do not purify it sufficiently for the effluent to be turned without further treatment into the nearest stream. Chief among these is the "International" process, in which the sewage is first clarified by means of the salts-of-iron precipitant called "ferozone," and the effluent then passed through filters of sand and polarite about 33 in. in total depth. This system is working well at Acton, Swindon, Hendon, and other places, and has earned the praises of many eminent chemists and sanitarians. It is described both by Mr. Crimp and Mr. Wardle, and has also been fully described and illustrated in these columns.† It seems strange, therefore, that no mention is made of it in a book of the dimensions of Messrs. Rafter & Baker's. Neither are the other chemical systems now in use in this country named therein, such as the Amines process, in which lime and herring-brine combine to precipitate and sterilise the sewage. We presume that these methods have not been tried in America, and that the authors have therefore thought it needless to draw attention to them; but in other parts of the book they have not preserved such reticence about distinctly British matters. Messrs. Rafter & Baker's chapter on Chemical Precipitation is, however, extremely useful. They declare (and this is almost as true of our own country as of America) that the really useful chemical agents for purifying sewage have dwindled to three or four—namely, lime, sulphate of alumina (alum), ferrous sulphate (copperas), and perhaps ferric sulphate. The results of the valuable experiments made four or five years ago at Lawrence, Mass., are given in several tables, and from these the authors have drawn twenty-six deductions, which would have been more telling if they had been better arranged. The use of

* "*Sewage Disposal Works;* a guide to the construction of works for the prevention of the pollution by sewage of rivers and estuaries." By W. Santo Crimp, M.Inst.C.E., F.S.I., &c. Second Edition, revised and enlarged. London: Charles Griffin & Co., Limited. 1894. Pp. xv., 349; 30 tables; 37 lithographed plates, and 14 figures in the text.

* "On Sewage Treatment and Disposal for Cities, Towns, Villages, Private Dwellings, and Public Institutions." By Thomas Wardle, F.C.S., &c. John Heywood: Manchester and London. 1893. Pp. xvi. and 426, 10 plates, and 57 illustrations in text.

† The *Builder*, April 11, 1891.

lime, with ferric sulphate, or aluminum sulphate, is said to be of very little benefit. Other deductions read as follows :—

"(17.) The practical difficulties of working the lime process renders (*sic*) the results in general inferior to those which may be obtained at the same cost in other ways.

(6.) The use of copperas alone is without much useful effect. . . . .

(18.) Copperas and lime treatment is difficult in practice owing to the necessity for adjusting the quantity of lime, although when such adjustment is properly made a good result is obtained.

(9.) Other things being equal, ferric salts are preferable to ferrous salts. . . . .

(21.) The results with ferric sulphate have been on the whole more satisfactory than those with aluminum sulphate.

(24.) By the use of a proper amount of either an iron or aluminum salt, from one-half to two-thirds of the organic matter of sewage may be removed. . . . . With the process carried out in detail the effluent can be discharged into a running stream without producing a nuisance."

In juxtaposition to this last it will be interesting to place the authors' deduction, No. 14 :—

"(14.) . . . The best of the various chemical treatments leave a relatively large number of bacteria in the effluent, together with such quantities of organic matter as may lead in a short time to the development of as many as were present in the original sewage. If any so left are disease germs, the effluent may be nearly as dangerous to public health as the original sewage."

The authors' conclusions are expressed in their deductions, No. 22 and No. 25 :—

"(22.) By reason of (*a*) variations in the composition of sewage at different places; and (*b*) changes in price of the re-agents, it is impossible to say that one [chemical] treatment is universally better than another.

(25.) The incompleteness of the purification in comparison with the cost of the process will be likely to confine the application of chemical purification to narrow limits."

While every one will agree with the first of these two final conclusions, opinions will differ as to the last. Certainly in England the opinion seems to be steadily gaining ground that the chemical clarification and deodorisation of sewage, especially when this is of a foul nature, are necessary, although at the same time it is admitted that further treatment of the effluent, by filtration or irrigation, will be required. Into the author's careful and exhaustive discussion of filtration and irrigation, we cannot enter now.

Although comparisons are odious to the persons compared, they may be not only entertaining but useful to others. In reviewing the three books now under notice, it is impossible to avoid ascertaining and comparing the opinions expressed in each of them on the most important divisions of the subject under consideration. One of the questions, which naturally suggests itself is—What method of treatment does each book recommend? And a second question, born of years of animated discussion, quickly follows :—What does each book say about Broad Irrigation? We have searched for answers to these questions, and append them here as instructive, and also as showing how "doctors disagree." But in making this comparison, allowance should be made for the weakness of American sewage in comparison with English, and for variation in other conditions.

QUESTION.

Which method of sewage-treatment do you consider to be, on the whole, the best?

ANSWERS.

Messrs. Rafter and Baker.

"The most efficient means of purifying sewage yet known, intermittent sand filtration." . . . . (p. 13.)

"In estimating the relative value of chemical *versus* [intermittent] filtration processes of purification, the practical question arises as to which process may be expected to furnish an effluent least adapted to support the life of bacteria. Experiments upon the effluents from the coarse-sand filters indicate that the organic matter remaining therein is in no case well-adapted to support bacteria. . . . Judging by chemical analysis alone, there is nothing in the effluents known, or even suspected by chemists, to be harmful. . . . Although not absolutely proven, there are nevertheless strong reasons for believing that the effluents from *fine* sand filters are entirely free from bacteria of every sort and kind, and if, on further study, it turns out that this is true, so far as present information goes, there is no reason to be urged against drinking the effluents from such filters." (pp. 289, 290.)

Mr. Wardle.

"There can be no doubt that a chemical treatment by precipitation is the safest and cleanliest method, especially if such treatment effects microbic sterilisation." (p. 42.)

"From all the information I have been able to obtain in this lengthened investigation and research, I am very strongly of opinion that the only safe method of sewage-disposal is first by chemical precipitation, then land (or other) filtration, and afterwards river or other water-course oxidation. Precipitation by chemical reagents removes much dissolved organic matter from the sewage, yet it leaves some for further disposal; land-irrigation removes much of this, but not all, as has been often enough shown in these chapters. The diminished proportion. . . . is effectively dealt with by river oxidation." (pp. 249, 250.)

Mr. Crimp.

[Mr. Crimp, we may say, is extremely cautious. He almost invariably prefers to quote the Report of some Commission or the words of some eminent doctor or chemist, rather than state his own opinion. The nearest answer of his, which we can find to our question, is the following.]

"Notwithstanding the fact that. . . . . the chemical treatment of sewage has received the concentrated attention of the most eminent chemists, it is still recognised that, in order to produce a sewage effluent of any substantial degree of purity, land must be employed in some form or other, or the effluent must be passed through artificial filters." (p. 30.)

QUESTION.

What is your opinion of broad irrigation as a method of sewage disposal?

ANSWERS.

Messrs. Rafter and Baker.

"The opinion has been expressed frequently that broad irrigation will not, by reason of the large amount of labour required, and the relatively high price of the same, be generally used in this country. There will, however, be some exceptions to this in especially favourable localities, and in the case of such public institutions as asylums, almshouses, and reformatories, where labour may be furnished by the inmates without expense." (p. 225.)

"There are some fallacies in regard to sewage-farming floating about, which, while exploded many years ago in England, where they mostly had birth, are occasionally cropping up in this country with as much vigour as though they were new discoveries. One of these is that vegetables from sewage-irrigated farms are of necessity watery; another is that cows fed on sewage-grown grass give less rich milk than those fed on ordinary grass; and a third, which may be considered a corollary to the first two, that sewage-grown products are less healthful than those from an ordinary farm." (p. 234.)

"There is some reason for believing that well-managed sewage-farms are not only not unhealthful to the neighbourhood in which they are situated, but that they may be even in some degree the source of an increased healthfulness of the region immediately surrounding them." (p. 252.)

Mr. Wardle.

"I have not the slightest doubt of both the possibility and the probability of danger to cattle feeding on pastures irrigated by crude sewage, urban or suburban." (p. 326.)

"It is conclusively proved that disease germs are conveyed to the blood and milk of cows by feeding on such polluted vegetation—that is, vegetation in contact with sewage above ground." (p. 56.)

"May we not safely infer . . . . that both milk and animal tissue must be vitiated by such pernicious influences, and, by being used as food, convey the virus and bacterial germs into the human economy, so causing zymotic and other forms of disease and a general lowering of health?" (p. 354.)

"The facts show incontrovertibly that many emanations [from sewage-irrigated ground] may be and are the cause of dysentery, diarrhœa, and typhoid fever." (p. 354.)

Mr. Crimp.

"That sewage possesses a certain manurial value is too well established to need comment, but whether that value can be profitably reclaimed by applying sewage to land must depend upon a variety of circumstances." (p. 142.)

"Briefly it may be said that, provided the area of land is sufficient for the purpose, and that it has been properly laid out, no nuisance need necessarily arise if the works are properly managed." (p. 143.)

"Although it would be rash to assert that under all circumstances sewage farming will not prove inimical to health, the evidence in favour of any general condition of unhealthiness resulting from its proper application is altogether wanting." (p. 145.)

What is truth? we ask after reading the bold paradox of Messrs. Rafter & Baker, on the one hand, as to the positively sanatory properties of sewage-farms, and the equally bold statements of Mr. Wardle, on the other hand, who denounces them as hot-beds of disease and death. Mr. Crimp's caution again stands him in good stead—*if* the land is sufficient, and *if* it has been properly laid out, and *if* the works are properly managed, no nuisance "*need necessarily*" arise. The truth is that irrigation, and filtration, and precipitation may all prove good or bad according to circumstances. There must be a brain at the head of all sewage works, and constant care must be observed. It is the lack of thought and care which has in many cases brought one or other system into disrepute. Pope's dictum about forms of government may be applied almost as truly to methods of sewage disposal.

> For forms of [treatment still] let fools contest,
> Whate'er is best administered is best.

Space forbids us entering into details respecting the descriptions and illustrations of sewage-disposal works contained in the second parts of Messrs. Rafter & Baker's and Mr. Crimp's books, and scattered throughout Mr. Wardle's work. The first two are much more complete in this respect than the last, the American book being of the three the most interesting to architects, as the methods of treating the sewage from several blocks of public buildings are described and illustrated. Among these we find that broad irrigation is adopted at the Hospital for the Insane at Worcester (Mass.), at the Massachusetts Reformatory, Concord, and at the Rhode Island State Institutions. Intermittent filtration is in use at the Massachusetts School for the Feebleminded, and (in conjunction with broad irrigation) at the London (Ontario) Hospital for the Insane; subsurface irrigation is adopted at the Lawrenceville (New Jersey) School for Boys, but the results are not quite satisfactory; and chemical precipitation, followed by intermittent filtration through land, has recently been adopted for the Rochester (Minnesota) Hospital for the Insane.

In conclusion, Messrs. Rafter & Baker's important volume contains a large mass of useful information, culled from the best authorities and gathered from actual inspection of executed works. The authors have carefully weighed all the evidence available, and in no case have they leapt to a hasty conclusion. The book is excellently printed on good paper, and the illustrations are remarkably clear and complete. The misprints are few and far between; we may, however, draw attention to the fact that the four illustrations on pp. 289-291 are wrongly numbered in the letterpress. There is a good index. The book will undoubtedly prove a valuable work of reference, although, on account of the lack of order displayed in Part I., it is not quite as interesting to read as it might have been; we trust that the authors will be able to remedy this defect when a second edition of the book is called for.

Mr. Crimp's "Sewage Disposal Works" has already attained the dignity of a second edition, and its author can therefore look with equanimity upon the remarks which reviewers may be disposed to make respecting it. This edition contains various alterations and additions which bring the theoretical part of the book up to date, and important chapters have been added in Part II. on the Sewage-Disposal Systems of London, Berlin, and Margate. It is, as the title of the book implies, with the practical part of the subject that Mr. Crimp mainly deals, and we have no doubt that engineers will give as cordial a welcome to this edition as they gave to the first. The book contains a good index, but at least one omission ought to be rectified—*sub-irrigation* is not mentioned in it, although described (very briefly, it is true), on p. 194.

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While Messrs. Rafter & Baker may be said to write as sanitary *littérateurs*, and Mr. Crimp as an engineer, Mr. Wardle undoubtedly writes as a chemist. His book deals principally with sewage-disposal in its biological and chemical aspects, and (of course) his own Ozonine-Ferricum Process obtains long and favourable notice, apparently, however, not undeservedly. From the extracts we have already made, it will have been gathered that Mr. Wardle does not observe the caution which is so characteristic of Mr. Crimp, but proclaims the dangers of irrigation and the blessings of precipitation with considerable vigour. The book, however, is marred by a great number of misprints, of inelegant and inexact expressions, and of ill-constructed sentences. On p. 92, Swinton is said to have a population of 24,000, and a sewage-flow of "about 240,000 gals. daily, or 15 [*sic*] gals. per head of population;" on the same page the filter-beds are said to have "four pipes" (instead of "four-inch pipes"), and to be capable of filtering "650 gals. of effluent per twenty-four hours." What becomes of the other 200,000 gals. Mr. Wardle does not say. On the following page we are told enigmatically that "the total working expenses amount to 420*l.* per annum, or about 6½d. per head of the population, which is a very low rate, as it is well known generally that the sewage can be treated at a total inclusive cost of 1s. per head." What this sentence means we do not quite understand, but the error in the cost per head is manifest,—420*l.* divided by 24,000 gives 4·2d., and not 6½d. The numbers of twenty-one answers on pp. 174 and 175 do not correspond with the numbers of the questions. "Bacillae" occurs on p. 316. On p. 229 Mr. Wardle declares that "upwards of" sixty sewage-works have been described in chap. xiv.; he means "nearly," for only fifty-five have been noticed. Here are a few choice sentences:—

"The effluent [from precipitation tanks] should be so purified as to be fit to turn into a river containing at least eight volumes of water to one of effluent without having been previously used for irrigation," p. 236. "Should it be deemed advisable to remove what is called the storm-water from the sewers, by which is meant both storm-water and that from ordinary rainfall, I am convinced that, generally speaking, only actual storm-overflows need be diverted," p. 357. "Cultivated by a proper rotation of rye-grass, three-years' roots, one year cereals, one year the latter without sewage," p. 38. "My experience of sewage farms is that they are *more or less of a nuisance*, with rare exceptions, *owing to exceptionally careful management!*" *

On page 296, Mr. Wardle speaks of some "*immensely minute*" micrococci, and is guilty of the inelegant expression "and so thus there are." We are told on page 360 that Manchester has "a fairly good water-supply of excellent purity." Many other instances could be quoted to show the carelessness with which the book has been prepared for the press, but we have said enough. We regret that these blemishes appear, for they tend to bring discredit on a book which contains much useful information, and which is evidently the outcome of reading, observation, and experiment extending over several years.

SURVEYORSHIP, RICHMOND (SURREY).—At a meeting of the Town Council of Richmond held on the 11th instant, the Town Clerk reported that 133 applications had been received for the appointment of Borough Surveyor. The applications were referred to a sub-committee, who will select a certain number of candidates to come before the special meeting of the Town Council to be held on the 25th instant, upon which date it is anticipated the appointment will be made. It was further resolved to present the retiring Surveyor, Mr. E. J. Lovegrove (who takes up his duties at Hornsey on the 29th instant) with a sealed illuminated testimonial, together with a cheque for 100 guineas, as an acknowledgment of the value of the services he has rendered to the Borough and the Council.

* The italics are ours.

NOTES.

THE tendency to a great activity in "improvements" on the Bedford Estate seems to be taking a form which may have a very prejudicial effect on what is at present said to be the healthiest district in London. A great many tall buildings for houses in flats have recently been erected on sites between Gower-street and Tottenham Court-road, which, if fully occupied, must considerably increase the population per acre in this part of Bloomsbury; but these are entirely out-done by a huge block which is just being completed in Charlotte-street, between Bedford-square and Oxford-street. How much these buildings have injured the adjacent old-fashioned houses in the matter of light and air may be imagined, but a more serious aspect of the case is that if this kind of thing is to go on, the population on the estate must inevitably be increased (if all these flats let) to a point a great deal beyond what on sanitary grounds ought to be permitted. Ground has been cleared for another large rebuilding in Russell-square, and there is every reason to fear that the same policy will be pursued here. If this goes on, the architectural effect of the old Bloomsbury squares, which in its way is quiet and pleasing, will be entirely spoiled; but the more serious point is that the neighbourhood will be dangerously overcrowded in the effort of the ducal landlord (or of his enterprising estate agent) to screw out of the land the utmost return that can be got from it. The matter is of serious concern to a large district of London. Bloomsbury is now, for residential purposes, as thickly planted with houses as it can be consistently with due regard to sanitary conditions. To say that no more square yards of ground are occupied by the new buildings that are going on is nothing to the purpose. It has long been recognised by sanitarians that you cannot crowd more than a certain number of persons on a certain space of ground with safety to their health, and whether they are crowded together horizontally or piled above each other vertically makes little difference in a sanitary sense. Something ought to be done, on public grounds, to put a check to this over-building. To appeal to the conscience or sanitary perception of the Bedford estate office would, of course, be useless.

AFTER much unfortunate controversy the site for the great National Industrial Exhibition which is to be held at Berlin in 1896 has now been definitely decided on, and the preliminary plans of the architect passed. Herr Hoffacker, who is quite a recognised specialist in exhibition work, Herr Bruno Schmitz, of competition fame, and Herr Griesebach, a representative of the most modern school of Berlin architecture, will jointly act as advisers of the Exhibition executive. As there is ample scope and a liberal exchequer, it is to be hoped that the three architects will be able among them to produce a fine example of an exhibition building. If we understand rightly, full advantage is to be taken of the river frontage, on which a number of minor buildings are to be erected. The main block will probably cover about 50,000 square mètres. The Crystal Palace covers approximately the same ground, whilst the superficial of the Palais de l'Industrie at Paris is just about half this.

THE Cathedral of Parenzo in Istria, near Trieste, is known by repute at least to all architectural students as one of the most interesting buildings in Western Europe. It was built by Bishop Euphrasius in the time of the Emperor Justinian, and is a very complete example of an early Christian church of the basilica type. It closely resembles the two famous basilicas at Ravenna, but differs from them to the extent that the basilica at Parenzo retains the octagonal baptistery and the square tower at the western end, which the Ravenna churches have lost. The mosaics are of singular beauty and completeness; they have, until lately, been ascribed to the thirteenth century, but are now believed to be of the same date as the church itself. The mosaics in the half-dome of the central apse at the west end were uncovered about four years ago, and have a dedicatory inscription by Bishop Euphrasius in Roman uncials. Cav. Boni, of the Department of Antiquities and Fine Arts at Rome, has recently published a pamphlet reprinted from the *Archivio Storico Venito*, illustrated by a series of photographs, descriptive of the cathedral and the mosaics, a copy of which is in the Library at South Kensington, and is worthy of the attention of every student of art. It is a subject for great regret that these unique mosaics are being "restored" in a manner which will go far to destroy their archæological, as well as their artistic, value. Cav. Boni, in his pamphlet, describes the treatment to which these decorations have been subjected, and contrasts it with the admirable manner in which the mosaics in the apse of San Giusto at Trieste were preserved from imminent destruction without impairing their authentic character, as related by Mr. T. G. Jackson in his "Dalmatia, the Quarnero, and Istria" (iii. 364).

IN the new number of the American "Journal of Archæology" (1894—2), Mr. A. L. Frothingham calls the attention of students of architecture to a very curious dome structure discovered at Vetulonia, in the artificial tumulus known as La Pietrera The general arrangement of this hypogeum is analogous to those of the Mycenæan funeral structures of the "beehive" type: but there is one fundamental difference, which marks the Vetulonia tomb out from all similar structures, both in Greece and Italy, and that is that in all these the circular dome building begins from the foundations, whereas at Vetulonia the ground plan is square. A secondary difference is that in Greece the slant of the circular walls begins at once, whereas at Vetulonia the square walls are exactly vertical till they reach the base of the dome, and the dome itself is not so sharply pointed as in Greece. In neither case, as Mr. Frothingham points out, have we a true dome, but in the Mycenæan structures we have the prototype of the Pantheon, while at Ventulonia we have a forerunner of the more advanced Byzantine dome on pendentives. The problem remains—why at Ventulonia have we the combination of the dome on the square ground plan? The dome tomb is a natural form growing out of the necessity of supporting the pressure of the superimposed earth. All tradition was in its favour. Two hypotheses are suggested to account for the square plan; 1. The ancient Italian tomb-chamber was rectangular, and the new-comers settling in Italy came under the influence of certain religious ideas connected with the form, and adopted it (this seems a little far-fetched. 2. The adoption of the square ground-plan had an earlier origin outside of Italy, in the East, and the tomb of Ventulonia may be lineally connected with squares halls of Assyrian palaces covered in by domes. The same number of the journal gives an account of the Boston Museum of Fine Arts, apropos of the publication of a catalogue of the Greek, Etruscan, and Roman vases. It will surprise many to hear that the Boston Museum contains a fine representative collection of Greek ceramics, amounting to no less than 896 pieces, of which 144 are from Naukratis. These last were presented to the Museum by the Egypt Exploration Fund in acknowledgment of American subscribers. The collection is specially rich in Attic vases of the black and red figured styles. The weak point of the collection is the absence of any specimens of ware from Hissarlik and Thera. The catalogue has a good preface on the history of Greek vases, and an account of the process of their manufacture.

THE *Archæologischer Anzeiger* for 1894 (pages 1–23) contains an elaborate and fully-illustrated discussion of the Sidon sarcophagi by Dr. F. Winter. It deals chiefly with the question of the relative dates of seven chambers with the seventeen sarcophagi. The oldest, according to Dr. Winter, are the "Lycian" and the Satrap sarcophagi—he dates both as belonging to the fifth century B.C. The sarcophagi of the "mourning women" is roughly contemporary with the sculptures of the mausoleum at Halicarnassus. These wonderful monuments were made, he thinks, not originally at Sidon, but probably at Athens, and were afterwards brought to Sidon. Of the scenes depicted on the famous "Alexander" sarcophagus no precise interpetation is as yet offered. The account is prefaced by a very complimentary notice of the activity of Hamdey Bey and his work in relation to the new museum at Constantinople.

THE German architectural journals seem to be well satisfied with the success of the ninth biennial gathering of architects at Strasburg. After the business meeting of the delegates of the allied architectural societies, to which we referred last week, the "Congress" was formally opened by the President, whose address was most enthusiastically received. Some four hundred architects were present, and the local authorities were well represented. As usual, the sight-seeing, banqueting, and amusements were the chief features of the gathering, but these were exceedingly well arranged, and the city certainly afforded ample opportunities for an instructive as well as pleasurable stay. Among the papers read were a description of the development of Strasburg, by Herr Ott, and two by Messrs. Barkhausen and Lauter, on the training of the younger generation of German architects, which led to an excellent discussion. Of the various excursions arranged, one to the neighbouring Colmar was much appreciated. Among non-German architects attending the Congress we notice the names of Herr von Gruber, of Vienna, and Herr Ritter, of Zurich. The Society of German Engineers have this year held their thirty-fifth annual gathering at Berlin, where a special engineering exhibition was arranged for the occasion. As the Society counts no less than ten thousand members, of whom some one thousand five hundred attended, the meeting was a very representative one. The exhibition, however, was practically only a re-arrangement of the German engineering exhibits sent to Chicago. The repetition was so complete that even the old Chicago catalogue was re-used.

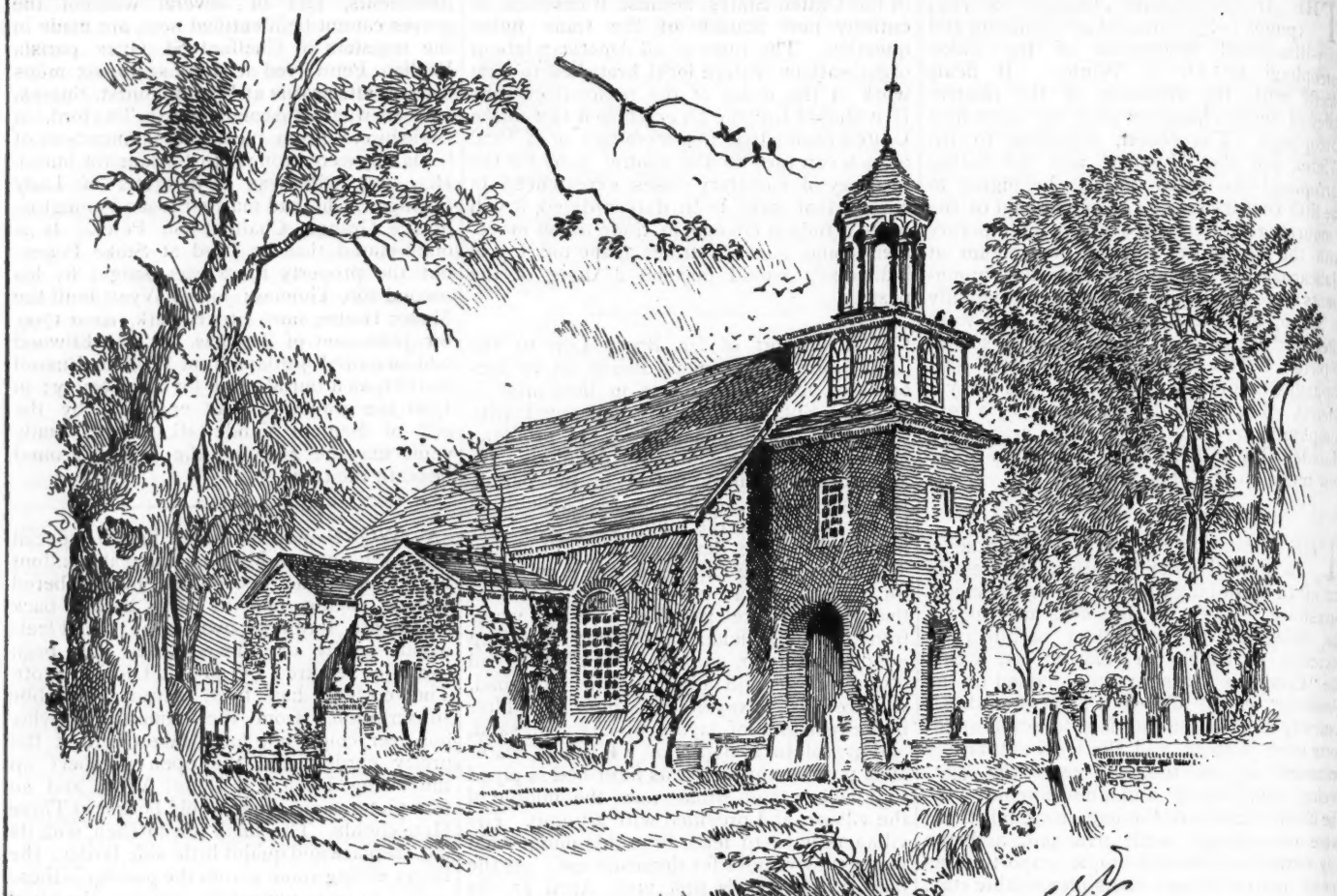
A UNION of railway men at Buffalo, in the State of New York, has just brought an action against its officials for the payment of strike money claimed to be due. During the strike on the Lehigh Valley Railroad last year, the local branch of the Order of Railway Conductors, at Buffalo, was ordered out by the National or Central officers of the organisation. The men obeyed the order, and, when the strike was over, they presented their claims of pay for the time lost. The central body of the organisation rejected the claims, and now forty-seven members of the Buffalo branch have entered separate suits against the Order for the recovery of from 200 dols. to 250 dols. each as strike pay. The defence set up illustrates the tendency amongst American trade unions to evade anything like responsibility before the law. The head of the Order of Railway Conductors argues that, if the Order had made any contract with the members to pay them their salary for quitting their employment under the circumstances, such contract was against public policy and in restraint of trade, and, therefore, void. The defence also pleads that the Order is not incorporated, and cannot be sued. The case is naturally exciting unusual interest in the United States, because it develops an entirely new feature of the trade union question. The rules of all American labour organisations require local branches to quit work at the order of the national officers. If it should become an establised fact in the United States that the members of a local branch can turn to the central body for the recovery of monetary losses experienced in strikes that have been duly ordered, it will make a radical change in trade union movements, and general strikes at the bidding of individuals would become a thing of the past.

THE Report of Dr. Bruce Low to the Local Government Board on an outbreak of anomalous illness in the Parish of Laxfield, Suffolk, is mainly concerned with the purely medical aspect of the problem, nor is the illness connected definitely with any special sanitary defect in the parish. But the general conditions of Laxfield, as briefly set forth in the report, seem decidedly favourable to the development of ill-health. The water supply of the village is provided for somewhat more systematically, it is true, than in many rural parishes. Surface water from adjoining fields is collected in a deep pond or reservoir, situated at the higher end of the village, and adjoining the high road, whence it is conveyed by a pipe to a filter bed consisting of layers of charcoal, sand, and gravel to a depth of 3 ft. The water after passing through this filter-bed is piped to a well or tank, situate near the middle of the village, and provided with a pump. The villagers have to fetch from this pump what water they require for domestic use. At the date of Dr. Low's first visit, April 17, the filter-bed had not been cleaned out, or the materials renewed, for two years. The water supply ran short last year during the summer months. There is no proper sewerage. Some drain-pipes are laid behind houses to convey away slop water, which finds its way sooner or later into the brook. Excrement disposal is by means of cesspit privies emptied at long intervals. Refuse disposal is by means of uncovered ashpits, often little better than holes dug in the backyards. The contents of these ashpits are from time to time disposed of upon garden land or allotments by the occupier. The dwellings are fairly good, though here, as in other rural districts, there is often noticed a reluctance to properly ventilate bedrooms by opening the windows during the daytime. This is a drawback to health in the dwellings of the poorer classes both in town and country against which the only practical influence is that of better education, which will have its effect in time.

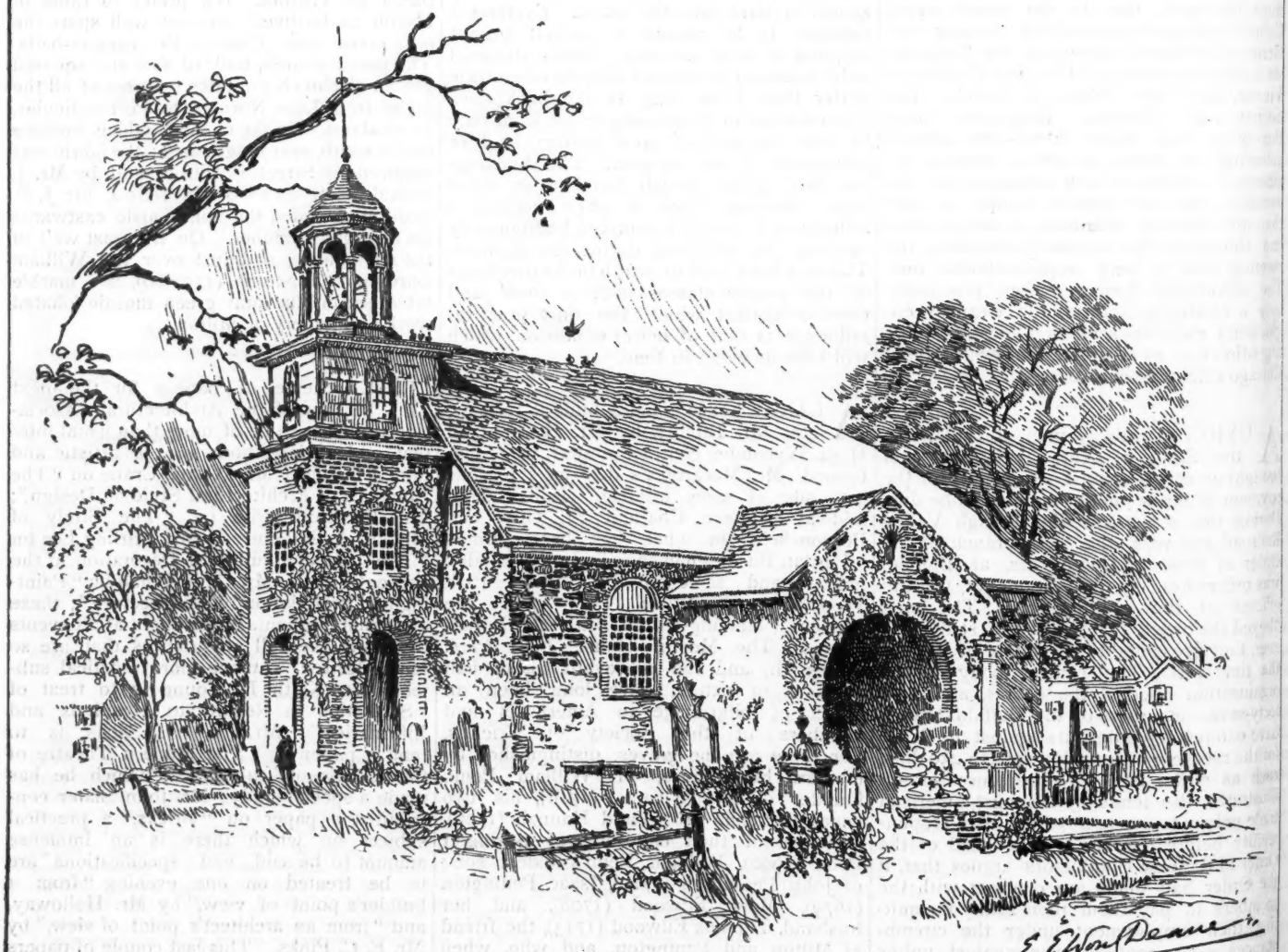
A LARGE house is being built at Jordans, for Mr. Ritchie, by Mr. H. Flint, of High Wycombe, contractor, after, we are informed, Mr. Macartney's designs. Jordans is a site of some interest. It lies about midway between Chalfont St. Giles and Beaconsfield, in what has been termed "Puritan Buckinghamshire." In the wooded hollow, and screened by Wilton Park Woods, stand Stone Dean and the Quakers' Meeting-House, with its burial-ground. The Meeting-House, built *temp.* James II., and the graveyard, about half an acre in extent, have long been an object of pilgrimage to Americans and members of the Society of Friends. For there are the graves, distinguished by modern head-stones, of William Penn, founder of Pennsylvania (1718), his two wives, Gulielma (1693) and Hannah (1726), and five of their children; of Springett Penn (1696), William Penn's eldest son; of John Penington (1710), Isaac Penington (1679), Mary Ellwood (1708), and her husband, Thomas Ellwood (1713), the friend of Milton and Penington, and who, when living with the Peningtons at Bottrells, took for Milton, in 1665, what he calls in his own "History": "a pretty box . . . in Giles Chalfont, a mile from me." Entries of these interments, and of several whereof the graves cannot be identified now, are made in the registers of Chalfont St. Giles' parish. William Penn lived at Heronsgate, six miles distant, afterwards at Worninghurst, Sussex, and then at Ruscombe, near Twyford, in Berkshire. From these places, members of his family were brought to Jordans for burial. His first wife was a daughter of Lady Springett, who had married Isaac Penington, of the Grange, Chalfont St. Peter. It is often stated that he lived at Stoke Poges: but the property there was bought by his second son, Thomas; James Wyatt built the Manor House, now Stoke Park, *circa* 1799, for John, son of Thomas. It was Ellwood who acquired Jordans from William Russell in 1671, as a burial-place for the Society; in 1748 the graveyard was enlarged, by the gift of Samuel Vandewall, whose family vault may be seen on the higher ground beneath the trees.

A WORD may be added here in special reference to Milton's home at Chalfont St. Giles. The six-roomed half-timbered cottage, being one of two back-to-back tenements formerly owned by the Fleetwood family of The Vache, has been carefully repaired by Mr. J. Oldrid Scott. The cottage has been saved, by public subscription, from the Americans, who, however, could not have taken with it the pretty garden and the open prospect up the rising Dean (or Dene) Way, and so to a picturesque group of old houses at Three Households. The small low kitchen, with its old fireplace and quaint little side larder; the larger sitting-room across the passage—these suffice to us to picture to ourselves the blind poet's domestic life at Chalfont, where he gave Ellwood a manuscript of "Paradise Lost," and, it is supposed, wrote his "Paradise Regained"; and our picture is very different from that presented by the room as now prepared for visitors. We prefer to think of Milton as he lived; we can well spare the old pikes and Cromwell's cannon-balls. The parish church, built of flint and squared blocks of clunch, contains features of all the styles from Late Norman to Perpendicular. In or about 1220 the chancel, which inclines to the south, was lengthened; the fabric was restored by Street in 1861-3, and by Mr. J. Oldrid Scott in 1889. In 1883-4, Mr. J. P. Seddon extended the south aisle eastwards for an organ-chamber. On the east wall of the south aisle, and just over the William Gardyner altar-tomb (1558-60), is a marble tablet set in blue and green mosaic foliated work, in memory of Milton.

THE scheme of papers for the next session of the Architectural Association promises to be of more than usual interest and variety, both on the artistic and practical side. Mr. Walter Crane on "The Influence of Architectural Style on Design"; Mr. Beresford Pite on "The Study of Modern Architecture"; Mr. Stirling Lee on "The Use of Sculptural Decoration at the Present Time"; Mr. C. W. Whall on "Painting and its Relation to Architecture"; these are announcements which ought at all events to secure the full attendances that are so much desired. Among more practical subjects Mr. Keith D. Young is to treat of "Sanitation in Regard to Hospitals and Infirmaries"; Mr. E. O. Sachs is to read a paper on "The Modern Theatre of the Continent," a subject which he has made a special study; Mr. John Slater contributes a paper on "Bricks," a practical subject on which there is an immense amount to be said; and "specifications" are to be treated on one evening "from a builder's point of view," by Mr. Holloway, and "from an architect's point of view," by Mr. E. C. Pinks. This last couple of papers ought to be both interesting and instructive to those who have yet to familiarise themselves with the practice of specification-writing.



Old "Swede's Church," Wilmington, Delaware: North-West View.—From a Sketch by Mr. E. Eldon Deane.



Old "Swede's Church," Wilmington, Delaware: South-West View.—From a Sketch by Mr. E. Eldon Deane.

HOLY TRINITY CHURCH, WILMINGTON, DEL.

THIS picturesque church (formerly Holy Trinity, Christina, Pennsylvania) was erected by the Swedish Lutherans and set apart for sacred use in the year 1699. It is recorded that at the time of its erection, such of the people as were too poor to contribute to the building fund lent their physical energies to the work, the women carrying the mortar in their aprons. Rev. Eric Bjork, its first minister, was recalled to Sweden in 1714 by order of Charles XII., and appointed pastor of the church in the mining town of Fahlun and provost of the district. We may surmise it was by his interest that the mining company of Fahlun presented, in 1718, the handsome church-plate comprising chalice, paten, and pyx, which are still in use—though after the Anglican ritual. This, and the Gloria Dei Church in Philadelphia, are two of the old Swedes' churches that, after the Revolution, came under the control of the Episcopal Denomination.

E. E. D.

THE HYGIENIC CONGRESS AT BUDAPEST.

THE eighth Congress of Hygiene and Demography, which has been held during last week and part of the present at Budapest, appears to have been as successful in regard to the numbers attending and the general interest in the proceedings as was expected, though the number of attendances has not equalled that of the London congress, the best attended of any that have been held. The number of English professional men, however, attending the Budapest congress has been larger than at any previous congress held in a Continental city. The influx of visitors was divided between many countries, North and South America, as well as Europe, Asia, and Africa, sending their contingents of representatives. Great Britain sent no official representatives of the Government or any of its departments, but the leading universities, colleges, and learned societies sent as delegates some of their most distinguished members. The Institute of British Architects was represented by three of its Fellows, Mr. T. W. Cutler, Mr. John Slater, and Mr. Arthur Cates; the Surveyors' Institution was represented by Mr. T. Blashill, Architect to the London County Council, and Mr. Arthur Cates; the Sanitary Institute by Sir Douglas Galton, Professor Corfield, Mr. Cutler, Professor J. Lane Notter, and Dr. John Sykes. Sir Douglas Galton, who was nominated also by the Institution of Civil Engineers, the Royal Society, and the Society of Arts, was unable to be present, but was a contributor of several important papers. Professor Roger Smith represented King's College, the London School Board, and the British Institute of Public Health. Professor Banister Fletcher represented the Corporation of London; Mr. Baldwin Latham, the Royal Meteorological Society; and Professor Victor Horsley, the Royal Institution. The medical profession was, of course, largely represented. Among English architects present there were also Mr. Aldwinckle and Mr. Locke Worthington. In one respect a disappointment awaited the Congress at the outset. Dr. Joseph Körösi had found that the subject for which he offered a prize of 1,500 francs for the best work on "Demography: its Progress in the Chief Countries of Europe and America," had branched out into so colossal an enquiry that three years would be too small to be devoted to the subject. It has been decided to divide the subject into three parts—I. The statistical aspect of demography from the point of view of the census, II. Natal statistics, III. Mortal or death statistics. Each branch will be given for competition at a different Congress, Branch I. at the next Congress in 1897, with two years interval of preparation; II. in 1900, with a similar interval; and III. in 1903.

An enormous programme of work had been provided, over 800 papers on the various subjects having been forwarded, of which about 10 per cent. were in English, from either the United Kingdom, the British Colonies or possessions, or the United States. The sittings of the Congress are held in a series of seven nearly contiguous buildings, forming the museum and class-rooms in connexion with the Polytechnicum and the Crown Park—and it was in one of the central blocks in the vicinity of the park that the "Fête of Welcome" on Saturday night, September 1, was given. The Hungarian Home Minister, M. Charles Hieronymi, received and welcomed the visitors. The ceremonial opening of the Congress took place on Sunday morning, when the brother of the Emperor-King, Archduke Charles Louis, was present on behalf of the Emperor, who was the patron of the Congress. At the Polytechnicum, the central building of the group in which the Congress was held, was an exhibition of objects illustrating the progress of sanitary science.

The real work of the Congress commenced on Monday the 3rd with the sitting of the sections. To facilitate the huge business, the central building of the Polytechnicum was disposed in offices, conversation-room for meeting of members, a long room with a staff of clerks and interpreters, in which each member found at a certain spot, indicated by the initial of his name, the papers, tickets, books, or other objects he is entitled to receive. Certain of the sections, indicated on a plan published in a daily conference journal, met in the upper rooms of this central building, and on passing through the court-yard the other sections were to be found in various other buildings of the Polytechnicum, indicated by enormous alphabetic letters. The business of the sections was supposed to commence at nine o'clock, but in most, the machinery not being on the first morning in perfect going order, there was some delay. In section I, devoted to bacteriology, there was a large attendance, and it was evident that throughout the Congress this would be one of the subjects which would be the most closely followed. Unfortunately the printed abstracts of papers were in but few instances available during the morning sitting.

Into a large portion of the proceedings of the sections we cannot of course enter. The discussions and papers in Section I., on the first day, for example, were too completely medical and chemical for our columns. In the course of the simultaneous proceedings in Sections II. and III., on typhus, small-pox, and diseases prevalent in the tropics, Mr. Ackworth read a paper by Miss Nightingale on "Village Sanitation in India," and Professor E. Lane Notter, of Netley Hospital, one on the "Hygiene of the Tropics." Miss Nightingale suggested a resolution in favour of Government help to improve the sanitation of Indian villages, a matter of more that local interest, as epidemics often arose from such villages, and spread far and wide. This suggestion was adopted, and it was further suggested that systematic endeavours should be made to instruct the native population in the simplest elements of sanitation. The most pressing need, it was stated, was the supply of wholesome and pure water, and the removal of refuse and insanitary matter from the neighbourhood of the dwellings.

Mr. Ackworth's paper described the arrangements made by the Metropolitan Asylums Board for isolating and treating small-pox patients in the metropolis on the group of three ships off Erith, of which the principal one is the twin-ship *Castalia*. In any extension of that accommodation which the future would inevitably render necessary, it was not proposed further to extend the system of hospital ships, but to obtain a riverain site in the vicinity, where a hospital, combining all the modern improvements, could be built. There were three principal reasons for not extending the hospital-ship system—1st, a ship as a structure was less stable than a building on land; it might take fire, or be destroyed by a collision or a gale; 2nd, it was impossible thoroughly to disinfect a ship without an entirely new equipment of fittings periodically, as had to be done in the case of emigrant ships, by the rules of the Board of Trade; and 3rd, the extension, if proposed, would give great umbrage to the traders and merchants of the port of London, who would rise in arms against it.

In the fourth Section three papers in French, one in German, and one in Hungarian were read, dealing with the health of workmen as affected by their hours of labour and their habits. The Hungarian, Mr. Axmann, of Budapest, in addition to the hours of labour question, discussed the extent to which accidents to workmen were due to the use of alcoholics, and he carried the following resolution:—

"Considering that 60 per cent. of the accidents happening in factories and workshops are caused by the use of alcoholic drinks, the attention of all Governments ought to be called to this fact. Dr. Axmann proposes that the price of drinks such as beer, which are less harmful, should be lowered as far as possible, whilst that of strong intoxicants should be raised high enough to render their consumption more difficult."

In Section V. nine papers dealing with infant mortality, and in Section VI. nine upon the physical education of school children were read, the most remarkable of which was one forwarded by Sir Douglas Galton; but as these dealt with physical education rather than sanitary conditions of school-building, they are out of our range. In Section VII. Mr. de Courcey Meade read a paper on the "Practical Ventilation of Sewers in Towns," and Mr. H. Robinson one on "Sewage Water and Purification by Filtration." A paper advocating a new system of separating the solid fæcal matter from the liquid, for the purpose of obtaining a strong manure on one hand and a comparatively pure effluent on the other, was read by a Russian engineer, M. Nadeine (of St. Petersburg). In this system the flush of water is used to set in motion a sort of little water wheel fixed under the closet-pan or sink, which at once separates automatically the solid fæcal matter from the liquid, the two streams falling severally upon peat, the one as effluent to be purified, the other to form, with the peat, manure, or if there is infectious disease in the house, to be at once removed and burnt. Traps and ventilators would, it is claimed, be unnecessary because the fæcal matter never liquefies nor gets into the sewers, and the water in the house drain, and even in the main drain, is never foul. The solid excreta, when it has passed by another channel to its proper receptacle, which is movable, is covered over by a shower of earth or peat as in the earth-closet system. A compost is thus formed of the peat and solid excreta valuable as manure, while nothing goes to the sewer except water. The objection to the system is the initial cost of fitting every house and every closet and sink with the automatic apparatus, but no cost would be incurred in subsequently carrying the contents of the sewers out to sea or in separation and disinfection at the outfall or in irrigation works. An estimate is given of the cost for a town of 10,000 houses requiring three sets of apparatus per house, which would cost 147,000*l.* annually to maintain, including 10,000*l.* for expenses of administration, the compost sold as manure being credited with an annual revenue of 200,000*l.*, showing a profit much more than sufficient to pay the interest upon the first cost of the separating apparatus. According to certificates of Russian experts the system has been successfully used since 1888 at Petrowsky barracks, and in some private houses in St. Petersburg; we accordingly give the particulars, but we regard the idea as perfectly chimerical for general use.

SECTION IX. (Hygiene of Public Buildings), and SECTION X. (Hygiene of Dwellings), were worked throughout as one section. One of the most important papers was by Professor Corfield on "The Protection of Residences against Sewer-air," of which the following is a summary:—

"1. Sewer-air to include the air of private house sewers, commonly called house-drains, as well as of the public street sewers.

2. The formation of sewer-air should be prevented by providing against the accumulation of foul matters in the sewers and their consequent decomposition.

3. To this end sewers should be made of oval or circular section so as to have no angles, and with smooth internal surfaces and to have a sufficient fall. They should also be made as small as possible, so that the water passing down them may flush them, and prevent air accumulation of deposit.

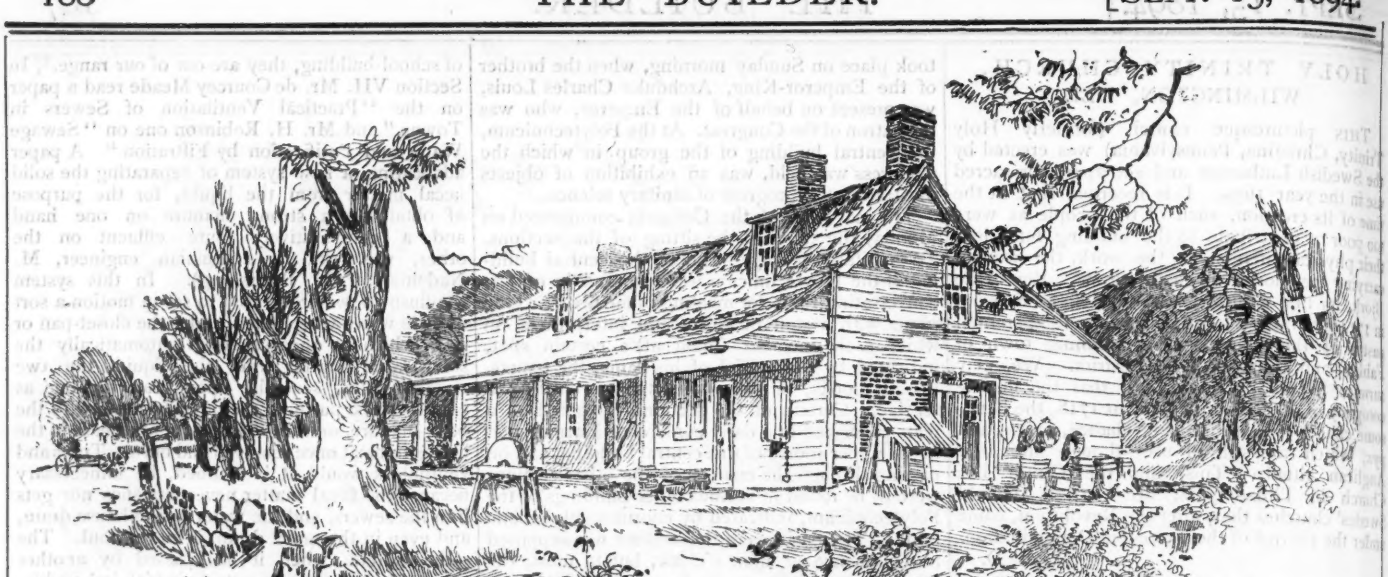
4. They should be well flushed by the water which passes down them, supplemented where necessary by the discharge from automatic flush-tanks.

5. They should be freely ventilated by means of frequent openings at the level of the streets so as to prevent the accumulation of foul air in them. Where such openings become a nuisance from the escape of large quantities of foul air, which is often the case in the upper part of sewers of steep gradients even though they be well flushed, pipes carried up above the houses should be substituted for the ventilators at the street level. Trays of charcoal fixed underneath the ventilating openings soon become useless as the charcoal gets damp and blocks the passage of the air.

6. Even with all precautions for the proper ventilation of the street sewers and the dilution of the air in them with fresh air the escape of air from the sewers into the houses must be prevented as it causes sore throats and diarrhœa and in certain instances specific diseases. Sewer air said by some to be innocuous. The experienced Medical Officer of Health knows better than this. One example sufficient. Deaths at an Infants Home from choleraic diarrhœa produced by escape of foul sewer air, owing to an improperly fixed disconnecting trap.

7. Methods adopted to prevent entrance of sewer air into houses. Flap-traps, mason's traps, syphon-trap. A water-trap practically a satisfactory preventive of the passage of foul air.

8. House drains (*a*) must be impervious to water and, practically speaking, to air also; (*b*) must have a good fall, say 1 in 120; (*c*) glazed stoneware pipes, coated iron pipes—watertight joints—testing of house drains; (*d*) free ventilation of house drains



Old Farmhouse
Eastchester, N.Y. (USA.)

—necessity of outlet—pipe recognised first in order to relieve pressure of foul air on the water-traps; (*e*) necessity of air—inlet now recognised; it should be close to the trap on the house drain, and on the house side of the trap may be in connexion with the manhole for access to the trap; (*f*) the air inlet only acts as such when the outlet is properly placed; if outlet is sheltered by higher buildings or chimneys, the air inlet will often be converted into an outlet, and foul air will escape from it; if the air inlet is properly placed no valve is required for it; (*g*) by disconnecting trap is meant water-trap provided with an air inlet.

9. Access of air from house-drains to be prevented by the drain itself being practically air-tight; (*a*) by the drains being as far as possible outside the house; (*b*) by the substance of the drains being air-tight; (*c*) by the disconnexion of the waste-pipes and rain-water pipes from the drains, so that air from the latter cannot get into them; (*d*) sometimes by the disconnexion of the soil-pipes also from the drains; but generally these are used as ventilating-pipes to the drains, and are connected directly with them; (*e*) by the soil-pipes being fixed outside the house and being made air-tight; to this end strong lead pipes with soldered joints are the best; (*f*) by continuing the soil-pipes up above the ridge of the roof as ventilating-pipes; (*g*) by fixing anti-syphonage pipes to the arms, connecting the traps of the webs with the soil-pipes, and carrying such anti-syphonage pipes up above the house to end in the ventilator of the soil-pipe above the arm from the highest water-closet; (*h*) by fixing water-traps under the apparatus of the water-closets, to prevent air from the soil-pipes escaping into the water-closets, and so into the house, the simpler forms of such traps the best, but anti-syphonage pipes to be fixed in all cases to prevent the traps being unsealed by syphonage; (*i*) the waste-pipes of sinks, baths, and lavatory basins to have ventilated syphon-traps to prevent outer air getting into the house through those foul waste-pipes, the gully receiving the waste-pipes of the scullery sink, to be flushed out by means of an automatic flush-tank so as to remove the grease, sand, &c. which collect in it; (*j*) the waste-pipes of all cisterns to be disconnected from the drains, soil-pipes, water-closet apparatus, and other waste-pipes, and to be made to discharge in the open air, so as to prevent foul air from the drains, &c., getting up them into the cistern."

Dr. Corfield, by means of diagrams and black-board illustrations, explained the difference between some of the ordinary forms of disconnecting traps and between effective and defective trapping, and pointed out in what respects the various traps were good or bad. According to the experiments of Dr. Frankland, the foul air could not pass through the water unless it was agitated, which in that case would be indicated by bubbles. The best system of drainage would be useless if not everywhere perfectly water-tight, and to test this it was necessary to fill it from end to end with water, to plug the ends and then watch it for half-an-hour; unless the water remained stationary at the same level for that time the system was useless. Professor Corfield then went on to give various details as to ventilating pipes, siphonage, wastes, &c., which our readers can easily imagine for themselves, but which may have been new to some, perhaps to many, of the Continental members.

Mr. Arthur Cates (London) said the warmest thanks of the section were due to Professor Corfield for the able exposition of the present position and practice of sanitation, which had been built up by the researches of a succession of eminent men, not the least important of whom was Professor Corfield himself. He had shown us how to keep out that most fatal of all enemies, sewer gas. He had shown us how necessary it was that there should be nothing passing through those pipes but fresh air, and how to form our drains and intercepting traps so that there could be no lodgment of foul matter in the interior to generate the fatal gas. In fact, the street and the house drains should be always clear. Excellent schemes of drainage had been spoiled by fractured joints which caused escapes, or defective construction which allowed of the accumulation of foul matter, and therefore it was desirable that the drain should be constructed as perfectly as possible. For many years it had been thought that ventilation of the drain was sufficient, but the professor had clearly shown that it was not enough, but that we must have also a clean flow. He could well recollect the controversy between the advocates of the large drain and those in favour of the small drain. They had now come to the conviction that so long as a drain could always take all the water that could find its way into it, the smaller the drain the better. It might seem to be temerity on his part to impugn the regulations of the London County Council, but he feared that the too stringent regulations drawn up by that body would tend to perpetuate the very evils they were intended to prevent, and that they would produce more evil than good. He was satisfied that within a short period those regulations would have to be re-modelled. We could not obtain absolute perfection, and they would have to revise these regulations if they were ever to receive any extended practical application.

Mr. John Slater (London) seconded the vote of thanks, adding a few practical observations. It was exceedingly important that the trap itself should be scoured out, and he had been accustomed to prescribe that they should be laid with good falls. The builder was unfortunately not always at liberty to put in the best size of pipe. He was often compelled to put in a 6-in. pipe where a 4-in. pipe would be sufficient.

Prof. Corfield, in replying to the vote of thanks, confirmed the views expressed by Mr. Slater as to a good scour being necessary. Self-acting valves were often prescribed, but they were an obstruction to the free entrance of air and were always a sign of want of confidence in the effectiveness of any system of drains, in which it might be employed.

At a subsequent stage of the proceedings Dr. Corfield put forward the following series of resolutions, which he urged the section to adopt. They were accepted subject to discussion on a following day. The resolutions were as follows:—

"1. That the general health of the population is improved, and the spread of disease prevented in towns and dwellings by the frequent removal of all foul matters and by copious supply of pure water.

2. That the paving of streets should be smooth, and as far as practicable impervious, to facilitate cleansing, and also to prevent contamination of the subsoil.

3. That the access of ground-air and moisture to houses should be prevented wherever necessary by means of an impervious basement floor, and a damp-proof course in the walls.

4. That house-drains should be water-tight, and should each be provided with a disconnecting trap to prevent access of foul air from the sewer, and be freely ventilated.

5. That street sewers should be ventilated in such a manner as to prevent foul air from entering the houses and streets, and should be well flushed, so as to prevent the accumulation of foul deposits in them.

6. That the minimum width of streets should be twelve mètres between houses, and that the houses should not be higher than the street in which they are, nor built back-to-back.

7. That regulations should be made by the public authorities, with the view of enforcing the practical application of the principles herein laid down."

We will continue our notes of the proceedings next week.

OLD FARM-HOUSE NEAR NEW YORK.

THIS is an interesting specimen of the very English kind of country buildings still to be found in the United States, belonging to the early period of colonisation, when English tastes and habits in building were still prevalent. The neighbourhood of Boston is, we believe, the best hunting ground for this kind of work, though this special example is at Eastchester, in New York State. The illustration is from a sketch by Mr. E. Eldon Deane.

COMPETITIONS.

LLANDUDNO MUNICIPAL BUILDINGS.—The Llandudno Improvement Commissioners have awarded the first premium in the above competition to Mr. T. B. Silcock, B.Sc., F.S.I., Bath; and the second premium to Mr. John H. Currey, A.R.I.B.A., Sutton, Surrey.

SCHOOLS, WEDNESFIELD.—An adjourned meeting of the Wednesfield School Board was held on the 8th inst. at the office, at Heath Town, to decide the competition for the new school to be erected at Wednesfield. A report was read from Mr. Robson, consulting architect to the Education Department, on his examination of the plans sent in in competition for the school, stating that the plan marked "Creon" was the best, and that marked "Compact" was second. Mr. Pool proposed, and the Rev. C. Pockney seconded, that the plan "Creon" be adopted. On the letters containing the names of the competitors being opened it transpired that the plan "Creon" was by Mr. Thomas H. Fleeming, architect, Wolverhampton; and that "Compact" was sent in by Mr. H. Farmer, architect, Darlaston. It was resolved to appoint Mr. Fleeming, the architect for the superintendence of the erection of the school. The other competitors included Messrs. Stanger, Veall, Lavender, R. Rowe, T. Bate, and J. H. Gibbons.

THE TRADES' UNION CONGRESS.

AT Thursday's meeting of the Trades' Union Congress, which was held at Norwich last week,

Mr. Terence Flynn moved :—"That this Congress is of opinion that it should be made a penal offence for any employer to bring, or cause to be brought, to any locality extra labour, where the already existing supply is sufficient for the needs of the district."

Mr. J. H. Wilson, M.P., seconded. The time was coming when this question would have to be faced. They had had to deal with blacklegs, but he thought the time was coming when they ought to deal with those who imported blacklegs, and who brought men to towns on the pretence that there was a scarcity of labour there. He hoped that the Parliamentary Committee would take the matter up, as it was one of the utmost importance to unskilled labour.

The resolution was carried.

Labour Commission.

Mr. Henry Broadhurst, M.P., moved :—"That in the opinion of this Congress the supplementary report of a section of the Labour Commission, signed by the president, the Duke of Devonshire, recommending additional legislation to the Trade Union Act of 1871, wherein trade societies may sue and be sued in a court of law for the enforcement of agreements, or for the acts of their individual members, is calculated to impose grave obligations, and to seriously imperil the position of trade unions of this country, and do hereby instruct the Parliamentary Committee to be alert in resisting any legislation of that character, as being utterly injurious to the true interests of trade unionism, and calculated to plunge us into costly and unnecessary litigation." He said a minority report of the Labour Commission, the original of which had been altered, had suggested that the unions should be registered, and entitled to sue all persons for all purposes, and that all persons for all purposes should be able to sue the trade unions. If these proposals had received legislative effect, every trade union would have been subjected to an action at law for any action done or words used by any of its agents or members. His opinion was that if this were to be so, in a very few years there would not be a trade union left in this country. The case of "Russell *v.* Temperton" showed the danger which they were in even under the present state of the law, but if the Duke of Devonshire's suggestion were acted upon they would be practically annihilated. The minority report, signed by Mr. Mann, Mr. Mawdsley, Mr. Abram, and Mr. Austin had exposed the dangers of the suggestion, which was ultimately simmered down into a milk-and-water suggestion that the unions might enrol themselves if they wished. He thought the thanks of the Congress and the trade unions generally were due to those who, in the minority report, had pointed out the dangers of the suggestion.

Mr. Weighell seconded the resolution, which was carried.

Sanitary House Accommodation.

Mr. John Ward moved, and Mr. A. Humphreys seconded : "That in the opinion of this Congress all Bills passing through Parliament giving sanction for public works which require a large influx of labour should contain a clause making it compulsory upon the promoters to provide suitable sanitary house accommodation for the workmen."

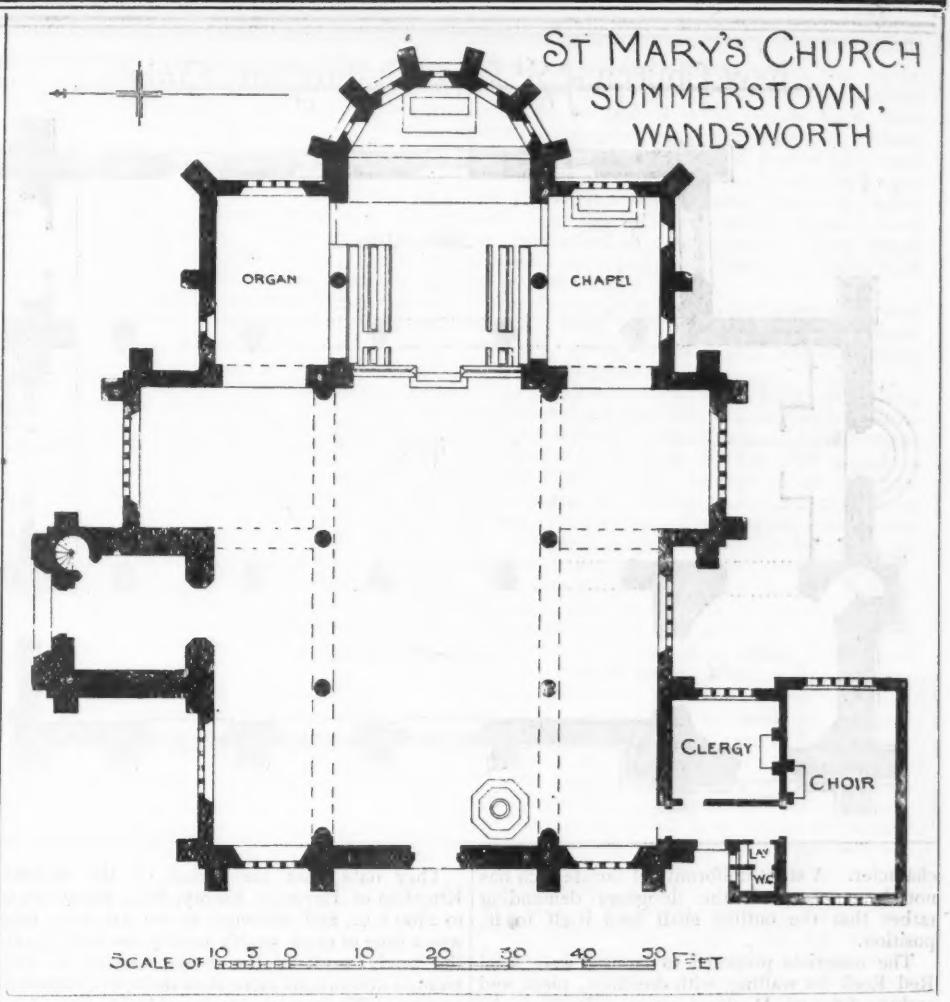
Mr. C. Hurley moved to add the following words :—"And that practical inspectors should be appointed to ensure the same being carried out."

Mr. Galloway seconded, and the resolution, with the addition, was carried.

The Congress was brought to a close on Saturday.

BIRMINGHAM GENERAL HOSPITAL. — On the 9th inst. the Duke and Duchess of York laid the foundation stone of the new General Hospital at Birmingham, the architect of which is Mr. William Henman. The total cost of the erection and equipment of the hospital is something like 206,000*l.*, including 50,000*l.* for the site, 5,000*l.* for Messrs. Barnsley & Sons' first contract for preparing the foundations, and 117,888*l.* their second contract for the actual buildings. Full descriptions of the building have appeared in our issues for March 19 and 26, 1892; and on March 26 of that year, and November 18, 1893, will be found several illustrations of the structure.

NEW ADDRESS.—Messrs. Jones & Attwood, of Stourbridge, ask us to mention that they have opened a London office at 110, Cannon-street.



Illustrations.

ST. MARY'S, SUMMERSTOWN, WANDSWORTH.

THIS church is about to be erected in the place of a smaller one built, some fifty years ago, so badly that, after having had the east and south walls underpinned at different times, it finally became so ruinous, owing to the great drought of last summer, that it was condemned by the London County Council and pulled down. The present design is extremely simple in character, and is to cost about 5,000*l.* The plan shows the arrangement of the interior, and chairs will be provided for 500 people. The early character of the chancel is due to the desire of the Vicar, the Rev. J. Y. Morton, to retain portions of the original church, and especially some stained-glass windows erected to the memory of the founders.

The materials used will be red brick and Westmoreland green slates for the external walls and roof. E. W. MOUNTFORD.

PROPOSED CHURCH OF ST. JOHN, WHITTINGTON.

THIS design, though prepared in accordance with a *bonâ-fide* commission for an intended church, and approved by the committee, has unfortunately not been carried out, owing to a variety of hindrances. The architect informs us therefore, that he can hardly say anything in the way of description of a building which has not been carried out, and which must therefore be regarded simply as a design for a church. The plan is appended (see page 190), and forms a sufficient explanation of the design. Both the views were exhibited in the Royal Academy of this year.

ST. JOSEPH'S CHURCH, DORKING.

THIS church is being erected to replace the existing temporary Catholic School Chapel. The site was given by the Duke of Norfolk, who also contributed 3,000*l.* towards the cost of the building, his Grace being Lord of the Manor. The church, which comprises nave, chancel, aisles, tower and baptistery at west-end, stands in a commanding position overlooking the town. The style is a severe form of Early English. Externally the walls are of Bargate stone, with Bath stone dressings, the roof being covered with Broseley tiles. Internally the masonry is of Beer stone, the capitals of the arcade and generally throughout being moulded, scarcely any carving being employed. The chancel is groined in wood with stone springers, while the nave and aisles have open timber roofs. The tower and one aisle will be temporarily omitted, leaving, however, in the position completed, accommodation for 400 persons. The present contract is for 5,500*l.* The architect is Mr. Fredk. A. Walters, F.S.A., of Westminster, the builders being Messrs. James Longley & Co., of Crawley, Sussex.

A MOORLAND CHURCH.

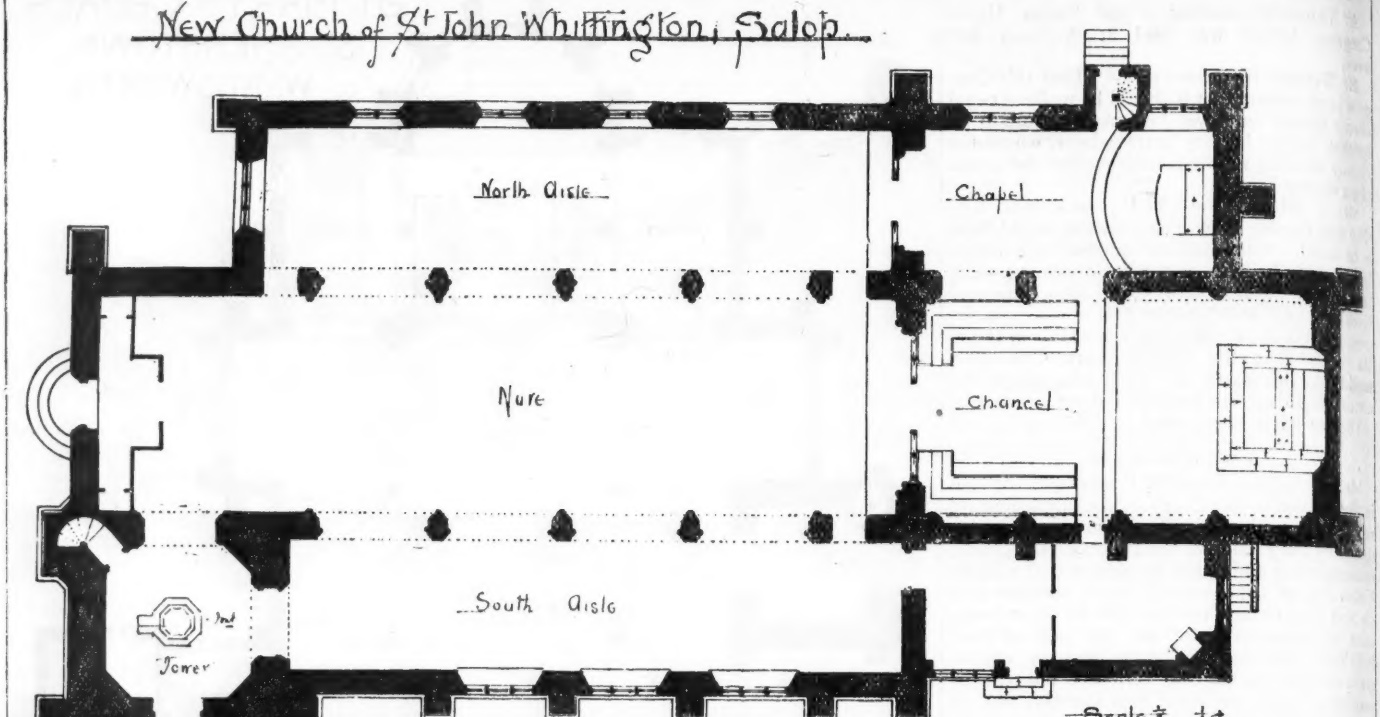
THIS little sketch is the outcome of a subject set by Mr. Norman Shaw, R.A., for the Royal Academy Travelling Studentship in 1893.

The problem was "a moorland church for 200 people, to have in close proximity, but not touching, a room for Sunday-school, and a shelter for the horses and vehicles of distant parishioners." It seemed to the author that the first principle in a design of this kind would naturally be *simplicity*, and an attempt has been made to carry out this idea through the whole design. Effect has been sought after by picturesque grouping and the employment of rough blocks of local stone in uncoursed rubble walling. The tower would be useful as a landmark ; it would contain a belfry, and on the floor level would act as a crush space for people leaving the church. The Sunday-school is connected by an arcade of wooden posts and "stone slate" roofing, an entrance for parishioners arriving by carriage being placed on each side. The school-room is treated with solid half-timbering and rough-cast filling, so as to give it a more domestic look, the shelter for horses being formed underneath, the ground sloping sufficiently for the purpose. The conditions of the original competition did not, unfortunately, allow of a perspective being exhibited, although, of course, one had to be prepared, a building of this description depending so much on the effective combination of its various parts.

B. F. FLETCHER.

COMPETITION DESIGN FOR COCKINGTON CHURCH, DEVON.

THE design was intended to accommodate six hundred, exclusive of choir. The sittings have been somewhat centralised upon the axis of the transepts, this central massing giving, it is believed, a dignity to a plan which is often rendered impossible by adhering rigidly to the Latin cross. The arcade has subordinated itself to the central idea, and yet preserved its essential



character. A strict uniformity of arcade arch has not been observed, the designers demanding rather that the outline shall lend itself to its position.

The materials proposed to be used were local Red Rock for walling, with dressings, piers, and arches, &c., of Doulting stone. Roofs to be covered with brindle colour Broseley tiles. A portion of the interior surface of the walls of chancel and baptistry was intended to be plastered for treatment with colour decoration. Elsewhere, the interior was to be faced with the Red Rock.

The roof to be of the ordinary tie-beam character, screened at a slight pitch with a wooden ceiling, panelled and decorated: The wood-work of ceilings and dados to arcade piers, &c., to be of deal, in the latter case stained a dark green, and "dull" polished; the floor of the sacrarium within the altar-steps to be of oak and walnut parquet, with steps of solid teak. The floor of the chancel to be of marble mosaic, with steps of polished Devonshire marble.

The design was submitted in competition by Messrs. Tait & Harvey, of Exeter.

Books.

"*Beni Hasan.*" Part II. By PERCY E. NEWBERRY, with appendix, plans, and measurements of the Tombs by G. WILLOUGHBY FRASER, F.S.A. London: Kegan Paul, Trench, Trübner, & Co., Limited, 1893. Folio, pp. 85, with preface.

THIS is one of the annual volumes issued by the Egypt Exploration Fund, forming part of the Archæological Survey of the Country, edited by Mr. F. L. Griffith, B.A., F.S.A. It completes the description of the remarkable series of rock-cut tombs at Beni Hasan, some of which are so well known to architectural students from the resemblance of the pillars in front to early Greek Doric columns, although the date of erection is much earlier.

The tombs stand upon the eastern bank of the Nile, the face of the low-lying hills having been cut away for their formation, and being elevated above the level belt of land, which is covered more or less by the rising waters when the river is in flood, they command a view of the Nile for a considerable distance. The entrances are facing the west, so that the last rays of the setting sun must have been full upon them. This peculiarity of position of the entire group is not, however, dwelt upon in the book before us, and we are left without evidence as to whether or not it is merely a matter of chance or otherwise. The better-known tombs have been described in the previous volume, and the series is now completed by a detailed description of the tombs, numbered 15 to 39.

They date from the period of the Middle Kingdom of Egyptian history, from about 2800 to 2500 B.C., and although, as we are told, this was a time of great wealth among the nobles, yet the costly work of the tombs consists in the painted decorations more than in the architectural features. They vary considerably in size and in importance, and a great number were never finished, in fact, one or two show hardly more than the commencement. At a lower level in the side of the hill are a series of sunken shafts, or mummy pits, but in the upper range the pits are covered by excavated chambers. These chambers have in front an open space formed by cutting away the sloping rock until sufficient elevation was reached, which formed the face of the tomb. The entrance doorway in every case occupies a central position in the fronts, and is approached at once from the open space, although in some few instances a portico of two columns has stood in front of it. The chambers, excavated in the solid rock, have mostly a square or quadrangular plan, the sides having been cut with more or less degrees of even finish; the roofs are sometimes arched, and with beams supported by inner columns, in one tomb (No. 18), by four rows of three each. A capital reproduction of a photograph illustrates this tomb, which is one of the most curious of the series. In many cases, nine in the thirty-nine tombs, the entrance into the underworld is represented by the jambs and architrave of a doorway, known as the "false door." In one instance it is painted only, in all the others they are represented in relief or by sculptured lines, so as to keep up the architectural appearance. They do not occur, as might be supposed, opposite the entrance, or with regard to symmetrical arrangement. On the contrary, they are placed mostly to the west. These doorways, as their name implies, are decorations only, and in no case do they form entrances.

In some few of the tombs, there are small inner chambers or shrines, opening from the eastern wall, opposite the entrance. The floors of the chambers are perforated with shafts, the mummy pits, which form the tombs proper, of which there are mostly several in each chamber. One of these, probably, as is stated in an appendix report by Mr. Willoughby Fraser, the deepest shaft that has yet been cleared out in Egypt, descended to the great depth of 105 ft. 3 in.

The doors appear to have been of wood, pivoted above into a wooden lintel, and resting below upon a pivot block of hard material let into a socket. None of the doors remain, but their indications are sufficient to show which were double hung, and which were single doors only.

The architectural features are mainly limited to the columns, although in two of the tombs, described in detail in the previous volume, dentils representing the ends of beams as if of wooden construction are represented. There are in tomb No. 17, still remaining, two beautiful columns out of six, which formerly appeared to support the roof. These, like the chamber, are rock hewn, and are formed by tapering shafts, in plan a quatrefoil, which stand on low chamfered circular bases and terminate in bell-shaped capitals of the same plan as the shafts, but with small square abaci. They have been painted over the entire surface with a bright orange ground, on which are three broad bands of green and one of deep red. The caps are lined out with green and white. In other tombs some of the columns are of similar design, very graceful and elegant in their proportions, but far too slender in appearance as supports to the stone roofs. They have fallen for the most part, leaving their caps suspended from the ceilings, as if to show their entire uselessness as a support to the living rock. Elsewhere there are octagonal columns, which are supposed to be the more usual sixteen-sided shafts in an unfinished condition.

The details of the tombs are carefully rendered in every case, there being plans of all, and sections and elevations to a scale larger or smaller as their importance and interest seem to merit.

But while the architectural features of the series are but few their costly nature is indicated by the fact that they were covered with wall-paintings and inscriptions of great beauty and value to the student of Egyptian history. The tombs, in fact, must have been a blaze of vivid decoration, and much as we may regret the many blanks in the illustrations, showing where the work has perished, yet it must be matter of congratulation to find so much still remains after the vicissitudes of much more than four thousand years.

The paintings consist of architectural decorations, inscriptions, and scenes mostly of everyday life, wrestling, processions, various occupations of husbandry, with some, but not many, temple scenes, offerings to deities, and such like. They are painted on a fine-grained coat of plaster, the pigments, which are mostly mineral, are red, blue, black, yellow, green, and white, laid on probably with a white of egg medium. While the walls are entirely covered with painting, the ceilings are left plain in all except three examples. The walls have a frieze above the figure scenes, which latter occupy the whole of the space above the painted dado which is common to all the examples. While the bulk of the dados are plain, in two instances they are painted pink and then splashed with red, green, and black to resemble rose granite. The doors, jambs, architraves, and columns, are all highly painted, and the imitation of rose granite is not unfrequently found. The scenes are mostly represented by rows of figures arranged horizontally without backgrounds, but frequently figures of large size are introduced. In others, the artists have represented the sandy desert on the top of the pictures while wavy lines below them represent the waters of the Nile. The arrangement of the subjects, the copying of various paintings from one tomb to another and many such

matters are noted in the book before us, but into which we have no need to enter.

Not the least valuable portion of the investigations made consist in the reading of the hieroglyphics. From these a series of biographies have been formed of the owners of the tombs. Genealogies, too, have been constructed, and are given. Each owner of the tombs has rendered a record of his life, with references to events, places, his family relations, and with many other details, which now, after so long a lapse of time, may be studied with surprise at the mass of information of the hitherto unknown past, which is now placed within easy reach.

Not only are the inscriptions rendered as they appear on the walls, but they are printed in hieroglyphics and translated. Plate after plate of elaborate detail now preserves for us representations of what has existed on the walls of the tombs during so many past centuries, and the volume before us is not a little interesting as showing the progress of research in recent years, when at last the key has been found to unlock the meaning of the writings on the walls which were regarded with so much surprise a few generations since. The Egypt Exploration Society has rendered good services by the publication of this volume, and to all who are concerned in its production hearty praise should be rendered.

It may be added that the tombs of Beni Hasan, although rifled of their contents at a period many centuries past, present but few evidences of later occupation, certainly of no later interments. One of the tombs appears to have been used as a Coptic school. Others have later inscriptions recording visits of travellers, while others seem to have been occupied by hermits in Christian times. A few articles of interest were discovered during recent investigations, but the painstaking work of clearing the deep shaft already mentioned, which was filled with rubbish, does not appear to have resulted in discoveries sufficient to reward the amount of pains and labour bestowed upon the work. We heartily recommend the work of the Egypt Society, and this book in particular, to all who are interested in the study of the records of the past. It is a new and an important addition to Egyptian history, and it is indicative of other important results to be obtained from the written records on the monuments.

The Gentleman's Magazine Library: a classified collection of the chief contents of the 'Gentleman's Magazine,' from 1731 *to* 1868. Edited by G. LAURENCE GOMME, F.S.A. Ecclesiology: Edited by F. A. MILNE, M.A. London: Elliot Stock. 1894.

THIS is another of the interesting series of reprints from the old numbers of the *Gentleman's Magazine*, at a time when it was apparently the principal organ for the discussion of subjects of interest in connexion with literature and art. We have before referred to a previous volume of these reprints; the present volume, containing the collected papers on ecclesiological subjects, is of great interest as a record of the opinions and feelings of educated people on the subject a good many years back, and in some cases also as containing information as to the then condition of churches which have since been altered by restoration. The first section of this volume, on "Buildings of the Tenth Century," does not go very far back, as the names of "J. H. Parker" and "Mackenzie E. C. Walcott" appended to some of the communications at once inform us; it is a record of a good deal of controversy as to the real age of buildings which were held by some to be earlier, by others later, than the tenth century; a controversy which has still not quite died out, though there is much clearer light upon it now. Parker, in one of the communications, relates how in 1861 Viollet-le-Duc told him that he would show him, at Rheims, a church of the ninth century—St. Remi to wit; and how, after they had examined it together, he French architect agreed with him that the earliest part of the existing fabric was of the eleventh century, and that the ornamentation had been altered in the twelfth century, and the apse added in the thirteenth. French archæologists have always had a tendency, however, to exaggerate the antiquity of buildings on their own soil.

The section on "Church Interiors" belongs mostly to the same period, though commencing with some notes by "Indagator," under date 1787, on parochial churches, "explaining the uses in which (*sic*) some of the most remarkable particulars yet remaining about our ancient parish churches were employed"; remarks the naïveté of which is curious from the present standpoint. Various papers of the earlier part of the present century, mostly about 1840 to 1860, on confessionals, chantries, rood-lofts, &c., contain a good deal of varied information; and a series of papers by "An Architectural Antiquary" on "Sculpture as Accessory to Architecture," dated 1833, and dealing entirely with Mediæval sculpture and carving, are well worth reading; one would like to know who the writer was. The remarks on "The Progress of Stained Glass in England" (1817) give an interesting example of the manner in which the subject was regarded by well-educated persons at that date. "The old glass-stainers excelled each other merely in dexterity of placing distinct pieces of a single colour so as to produce the effect of light and shade, but in an imperfect degree, from the harshness of the outline. . . . But the attempt at an exact imitation of painting on canvas, as if the subject were merely transferred from one substance or superficies to another was reserved to the present age," viz., to Reynolds's windows at New College; and the writer goes on to observe how "the late Lord Orford" (Horace Walpole) "withheld his suffrage from the praise which an attempt at once new and successful had universally received from men of taste"; and he quotes T. Warton's poem addressed to Reynolds on the subject. Referring to the Mediæval glass, Warton writes:—

> "Where superstition with capricious hand
> In many a maze the wreathed window plann'd,
> With hues romantic ting'd the gorgeous pane,
> To fill with holy light the wondrous fane."

But contemplating the "Classic merit" of Reynolds's design, he exclaims—

> "Thy powerful hand has broke the Gothic chain,
> And brought my bosom back to truth again."

Will the time ever come round, one wonders, when men will think Warton was right and we are wrong?

The section on "Church Bells" gives us, without any satiric intent, some characteristic contrasts in regard to inscriptions on bells; "Soli Deo Gloria, 1664." for instance, may be profitably contrasted with "Cast by John Warner & Sons, London, 1859." This is it is to live in an age of progress and business capacity. The section on Church History contains some notices on "Cathedrals Prior to the Civil Wars," from an old MS. of three gentlemen of Norwich, which is really curious and well worth preservation. The notes on the "Documentary History of English Cathedrals" collect together references to, and quotations from, a number of Mediæval documents. We should mention also an article dated 1862, by Mr. C. A Buckley (architect), "Notes on the Churches of the Friars Preachers." We can recommend the publication to all who are interested in church architecture, and in the history of the Mediævalist revival and the influences which led up to it.

The Dwellings of the Poor and Weekly Wage-earners in and around Towns. By T. LOCKE WORTHINGTON, A.R.I.B.A. With an introduction by G. V. Poore, M.D., F.R.C.P. London: Swan, Sonnenschein & Co. 1893.

DR. POORE'S introduction is little more than a complimentary recommendation of Mr. Worthington's thoughtful little book, the object of which is to consider some points in regard to the dwellings of the poor in large cities; the possibility of having them home-like, sanitary, and remunerative to the landlord. The author lays stress on the advisability of encouraging the dwelling of artisans outside of towns, by the further development of cheap trains for working-men, and on the preference for cottage homes rather than "model" houses of the barrack type. In this latter respect he will find much support for his views. All who pay any attention to the subject are beginning to see that capitalists who house people in large concentrated block dwellings, "while perhaps benefiting a small portion of the community, are encouraging the overcrowding on space for which the modern town has an unenviable reputation;" and on another page he recommends, and rightly, that "the maximum number of persons who can be safely and well housed on an acre should be clearly stated by law, and enforced by the local authorities;" or, say rather, the restriction to the limit should be enforced.

In regard to out-of-town dwellings for artisans, however, it is difficult to see how further demands can well be made on the railway companies without in fact calling upon them to take a kind of philanthropic line of action in providing much more cheap travelling than it can at all be in their interests to provide. It may be doubted too, whether it is quite true that "well-designed houses, with good plan and suitable exterior and interior, often secure a better return than badly-planned dwellings with ugly exteriors." It would no doubt be true if small houses were more plentiful than people to live in them; but as long as there are such a number of people who must have houses of some kind, the cheaply-built ones may command nearly the same rent as the better ones. For the well-to-do artisan a good house can be provided at a remunerative rental which he can afford to pay; the difficulty is rather with the poorest class.

Mr. Worthington devotes a chapter to French cottage homes, and another to French block dwellings, giving several plans, and comparing them with English.

The recommendations as to light, ventilation, and drainage are intended, we presume, for general readers interested in the subject, as a guide to the right course to be taken and the right objects to be kept in view; and are such as are generally agreed upon now among sanitarians, though we do not see why Mr. Worthington recommends that intercepting traps and inspection chambers should be "as near as possible to the sewer."

The important subject of "House Refuse" occupies a chapter, and some details as to the average amount of this per head per annum in towns, and the difficulties of dealing with it, will open the eyes of readers who have no previous information on the subject. A short outline of legislation in regard to old buildings and new buildings occupies two chapters. The general conclusions on the subject are summed up in eighteen paragraphs in the final chapter, embodying conclusions which are fairly deduced from the premisses, and to which we recommend the attention of philanthropic capitalists and others who are interested in the subject of the dwellings of the poor.

The value of the book consists in the fact that it gives, within a small compass and in a readable manner, a summary of the present situation in regard to the dwellings of the poor, with a good many suggestions for the future which are worthy of consideration. We must not, however, lose sight of the fact that part of the problem of providing housing for the very poor—the actual existence, in fact, of the very poor—arises in great measure from improvident marriages and other causes for which the poor in a mass are themselves responsible, and that to endeavour to make things abnormally cheap for them in the way of living and travelling is only to approach a form of pauperisation. There is a line to be drawn beyond which we cannot wisely go.

The Sanitary Arrangement of Dwelling-houses. By A. J. WALLIS-TAYLER, Assoc.M.Inst.C.E. London: Crosby Lockwood & Son. 1894.

THIS is described as "a handbook for householders and owners of houses," and is intended, as we learn from the preface, to supply the want of a cheap and not too technical treatise on sanitation for those who wish to have a general understanding of the subject. Our impression is that small and inexpensive books on sanitation are really rather numerous; certainly we have received a good many of late years of various degrees of merit. This one is above the average, and is well illustrated with a number of diagrams of various kinds of drain-pipes, traps, closets, &c.; the illustrations are well selected and the explanations clear. There seems to be a curious slip in the description of the forms of closet-basin illustrated in Figs. 39 and 40, as having the advantage of having "the dead water in the basins unusually deep," whereas the sections show the reverse to be the case; the syphonic closet, Fig. 48, illustrates what may be properly called a deep-water basin, which is one of the best characteristics of this basin, which, in fact, is an admirable one in every way as long as one can always depend on the syphon to act. There is, however, an element of uncertainty about a syphon-closet action, and if it does on any occasion fail to act the result is awkward to deal with.

We can recommend this book for the class of readers for whom it is intended; they will get a good outline of the subject from it, and it is in most respects well up-to-date.

Practical Building Construction. A handbook for students preparing for the examinations of the Science and Art Department, &c. By JOHN PARNELL ALLEN, Surveyor. London: Crosby Lockwood & Son. 1893.

THIS is a large book containing a great deal of information accompanied by nearly a thousand

diagrams illustrating points in ordinary construction, and is in the main very well done and very complete. It is intended for the use of students in every trade connected with building construction, and will form a very good primer for obtaining a knowledge of the general processes of building construction; but it must be added that it is rather a statement and illustration of general practice than of principles. For instance, it is stated that fireplace openings "are arched over by a chimney-bar curved to the form required" (it should be rather said they are arched *on* a chimney-bar); this is the case in many parts of the country, but not universally; and it should have been pointed out that this is a bad principle, as the bar would tend to straighten in a case where any heavy thrust came on it, and therefore become useless as a tie. This is a small matter in itself, but it indicates that the author has taken what is done as the criterion, rather than what should be done. Under the head of "Damp-Courses" again, we have a number of expedients given, but no very definite guide as to which is the best method; and the same with fireproof floors, &c. The book, in fact, is a kind of elementary dictionary of construction as ordinarily carried out, only not arranged alphabetically; it is however very fully indexed. As such it may be recommended as giving a great amount of elementary information compressed into a volume of no great size or cost, and we have no doubt it will prove very useful to many students as a first book to give them an all-round view of the general processes of construction. The author is Lecturer on Building Construction at the Durham College of Science.

Building Construction. Key to Examination of Science and Art Department (Subject III.). By HENRY ADAMS, M.Inst.C.E., &c. London: Chapman & Hall. 1894.

THIS is a small but very useful book, as the manner in which it is laid out encourages the student to think for himself as to the methods and principles of construction, and the reasons for them. It is in question-and-answer form, the method being mainly to ask the student to draw a diagram, for instance, of a roof for a certain span under certain conditions, the correct or best way of doing it being given in a diagram as the "answer"; or in other places to ask the student to correct or fill in a diagram which is purposely incomplete. A student who "means business," and does not allow himself to be tempted to look at the answers till he has thought out the question for himself, may gain a great deal from this small book, and the name of its author is a guarantee as to the accuracy of the "answers."

A Few Chapters on Workshop Reconstruction and Citizenship. By C. R. ASHBEE, M.A., Architect, King's College, Cambridge. Guild and School of Handicraft, Essex House, Mile End-road. London. 1894.

WE have seen some good work, of a simple kind, turned out from the School of Handicraft which Mr. Ashbee has been instrumental in forming, but we do not think he will improve his position or that of his "Guild" by literary ventures of this kind, consisting of essays in which imaginary puppets under the significant names of "Mr. Pusbington," "Mr. Trudge," &c., are made the vehicle of social and artistic satire of that easy school which consists in decrying everything and everybody at present existing, sneering at the Royal Academy and the Institute of Architects, and at nearly all the architecture and art of the day. In a literary sense there is nothing more vulgar than this kind of writing, nor of which the trick is more easily acquired; and if architecture were really in as wretched a state at present as the author would have us believe, it would not be revived or enlightened by a style of criticism which suggests the reflection that the remedy is worse than the disease. The ugly and grotesque scrawl on the cover of the volume, apparently intended for a "landscape with geyser" (as they say "landscape with cattle" in old catalogues) is but a too characteristic symbol of the contents inside the covers.

REBUILDING OF PREMISES FOR INSTITUTION OF CIVIL ENGINEERS.—The Institution of Civil Engineers are rebuilding their premises in Great George-street, Westminster, at a cost of about 45,000*l.* Mr. Chas. Barry, F.S.A. is the architect, and Messrs. Mowlem are the contractors. The whole of the floors are to be fireproof, on the Fawcett system.

Correspondence.

To the Editor of THE BUILDER.

PROPOSED CATHOLIC CATHEDRAL AT WESTMINSTER.

SIR,—I scarcely agree with your correspondent "Roman" as to the advisability of an international competition for designs for the proposed new cathedral. Such a competition is apt to call forth too much of the prize medal order of design, whereas the requirements of an edifice, which will be both a cathedral and a collegiate church, are very minute and exacting, and call for a long and careful study of the subject. I believe the work will be safe in the hands of Mr. Bentley, who, I hear, proposes to make a special study of the basilicas of Italy so far as they offer suggestions for his new work. Unfortunately the site is very much enclosed, and will hardly be visible at all from Victoria-street, Westminster. Would it be possible to have a detached tower and baptistery? The former might be made a prominent feature; otherwise, if carried out on strict basilican lines, the building will be invisible from any side until close upon it. BASILICA.

*** We certainly think that the matter is quite safe in Mr. Bentley's hands.—ED.

PICTORIAL ARCHITECTURE.

SIR,—In the issue of *Black and White* for August 25, is published an illustration representing the picture by Mr. Frederick Roe, entitled "The Trial of Joan of Arc."

Inasmuch as the trial took place at Rouen, it becomes a question as to how far the artist was justified in depicting it as being conducted in St. Bartholomew's Church, Smithfield. That this impression is conveyed by the picture in question, will, I venture to think, be apparent to all students of architecture, and to the majority of the intelligent public.

I send by the same post a copy of the publication I refer to, and a view of the church which is reproduced from a photograph.

STUDENT R.I.B.A.

*** Whether from St. Bartholomew's or not, the representation is of English architecture, and represents nothing that could have existed at Rouen. It is one more example of the curious indifference of popular illustrators, scene-painters, &c., to architectural truth.—ED.

LITHOGRAPHIC MATERIALS.

SIR,—Some time ago, a circular was sent to my office by a firm offering to supply small lithographic outfits suitable for use in offices. As I have mislaid their circular, can any of your readers supply me with the address of the firm who sent it out?

J. R.

The Student's Column.

DETAILS OF RURAL WATER SUPPLY.—XI.

PLANS, SECTIONS, LEVELLING, NECESSARY DATA.

HAVING investigated the available sources of suitable water in the neighbourhood of the district to be supplied, made careful gaugings, levellings, and obtained all possible information as to permanency of supply, compensation for water-rights, probable demands for easements or purchase of land, and the nature of the ground with regard to excavation for reservoirs, laying mains, &c., it becomes necessary to embody or record the results obtained in the form of Plans, Sections, and Reports.

Water engineers have nowadays much to be thankful for in being able to obtain at a low cost he accurate surveys afforded by the Ordnance Department, instead of having to make special surveys for themselves—always tedious and often unnecessary. The Ordnance Surveys are issued on several scales, and can be obtained from Mr. Edward Stanford, Charing Cross, London, S.W., sole agent for England & Wales. The following information is extracted from a small pamphlet issued gratis by Mr. Stanford:—

1.—$\frac{1}{500}$ (=10·56 ft. to a mile) for towns with population over 4,000. Some towns have been published on the scales of $\frac{1}{528}$ (=10 ft. to a mile) and $\frac{1}{1056}$ (=5 ft. to a mile).

Each sheet represents 24 chains by 16 chains. Price, uncoloured, 2*s.* each. Coloured, 2*s.* 6*d.* to 10*s.* 6*d.*

2.—$\frac{1}{2500}$ (=25·344 inches to a mile). Each sheet represents 1½ mile by 1 mile. Price, uncoloured, 2*s.* 6*d.* each (with areas printed on, 3*s.*). Coloured, 2*s.* 6*d.* to 23*s.*

Approximately 1 square inch on these plans equals 1 acre.

The area of each enclosure, together with a reference number, is printed within it on the plan. The brace } on the plans indicates that the spaces so braced are included under the same reference number. Areas are computed to the centre of the fence or other boundary of the enclosure, except in the following cases:—

1.—When the fence or other boundary is also the boundary of a parish or other civil division which does not follow the centre of the fence, the area is calculated to the parish or other boundary, and not to the centre.

2.—The fences, &c., bounding either side of a railway are included wholly within its area.

Altitudes are given in feet above the approximate mean water at Liverpool. Those indicated thus—⩚ B.M. 54·7, refer to marks made on buildings, walls, &c., and are called bench-marks. Trinity high-water-mark, which is the level of the lower edge of a stone fixed in the face of the river wall on the east side of the Hermitage entrance of the London Docks, is 12·48 feet above Ordnance datum.

3. Six in. to the mile. Each sheet represents six miles by four miles. For certain counties quarter sheets, which are reductions of the $\frac{1}{2500}$th plans, may be obtained; these represent three miles by two miles. Price, full sheets 2*s.* and 2*s.* 6*d.*, quarter sheets 1*s.* each.

4. One in. to the mile. Each sheet represents eighteen miles by twelve miles. Price (with one or two exceptions) 1*s.* each.

Before ordering plans an index map of the county, parish, or town in question should be obtained from Mr. Stanford. This will greatly facilitate the purchase, and save much delay and annoyance. It is generally best to have the sheets mounted on brown holland before they are sent. The charge is not heavy and the results are excellent.

The $\frac{1}{2500}$th, commonly known as the 25 in. to the mile, scale is usually the most suitable for the general plan of a waterworks. Upon this plan the position of reservoirs and pumping-stations, and the lines of mains and branches are marked, the dimensions of the pipes being figured upon them. The positions of sluice-valves, air-valves, hydrants, &c., are also indicated. The names of the owners and occupiers of all lands upon which it is proposed to construct works or lay pipes should be written in the enclosures; and the names of owners and occupiers of mills or other property in connexion with which claims may be made as regards riparian rights, should also be entered against the property in question.

Careful levellings must be made along the proposed lines of pipes, and these should be plotted to the same horizontal scale as the general plan and to a vertical scale of 20 ft. to the inch.

Detail plans and sections of reservoirs, pumping-stations, &c., should be drawn to a scale of not less than 8 ft. to an inch.

The hydraulic mean gradients should be drawn upon the sections of the main and branch pipes.

The following example will show the method of calculation by which the losses of head due to friction, and hence the hydraulic mean gradients, are found. Suppose the storage reservoir to be situated at A (Fig. 16) and that 8,640 gals. per day are to be delivered at the point C, 11,520 at the point E, and 14,400 at the point F. The lengths of the main and branches are shown on the section; also the levels at each point.

As the demand during the summer is greater than that in the winter, and the demand during the middle of the day much exceeds that of the remainder, it is usual to take three times the average rate of supply as the basis upon which the diameters of the mains and branches are calculated. Reducing the rate per day to gallons per minute, the system must be so designed as to enable 18, 24, and 30 gals. per minute to be discharged at the points C, E, and F, respectively, with the head available.

Assume a 4-in. pipe from A to B,
3-in. pipe from B to D,
2-in. pipe from D to F.

Draw the horizontal line AA′ through A, and produce the ordinates through B, D, C, F, E, so as to cut AA′, at B′, D′, C′, F′, E respectively. Then by the formula $G = \frac{\sqrt{(3d)^5 \times H}}{L}$ (or in practice by a set of tables), the loss of head due to the discharge of 18+24+30=72 gals. per minute through the pipe A B is found to be 83 ft.

Make B′B″=83 ft. and join AB″. Then AB″ is the hydraulic mean gradient for the section AB, provided that no point in the pipe AB rises above the line AB″.

In the same manner the loss of head due to the discharge of 24+30=54 gals. per minute through the pipe BD is 79 ft. Make D′D″=83+79=

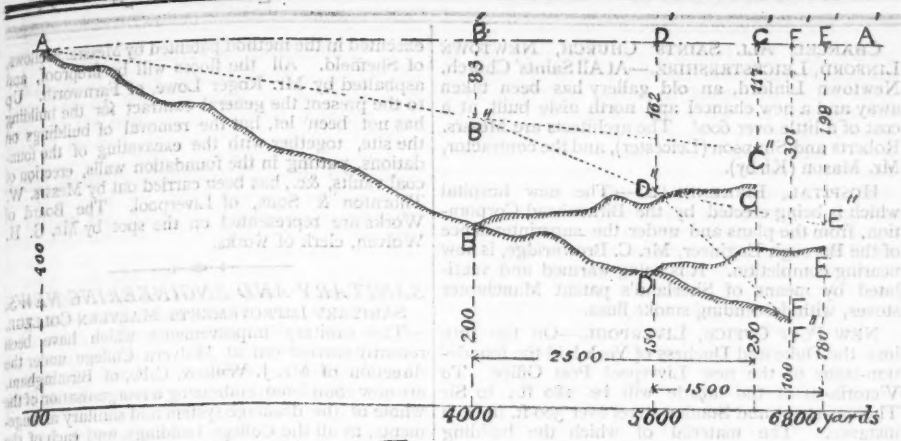


Fig. 16

162 ft. and join B″D″, which is the hydraulic mean gradient for the pipe BD.

Again the loss of head due to the discharge of 30 gals. per minute through the pipe DF = 139 ft. Make F′F″ = 83 + 79 + 139 = 301 and join D″F″, which is the hydraulic mean gradient for the pipe DF.

The point F is therefore only 1 ft. above the hydraulic mean gradient at that point, and this may be neglected as insignificant. It now remains to determine the diameters of the branch-pipes BC and DE.

The head at the point B, or the distance of the hyraulic mean gradient above that point, being 400 − 200 − 83 = 117 ft.; and the point C being 250 − 200 = 50 ft. above the point B; the available head at the point C is 117 − 50 = 67 ft. The diameter of a pipe 2,500 yds. in length to discharge 18 gals. per minute with a head of 67 ft., is found from the same equation to be 2·184 in.

A 2½-in. pipe (the commercial size next above 2·184) would therefore be used for this branch. The loss of head using a 2½-in. pipe, calculated in the same manner as in the previous cases, will be 34 ft. Make C′C″ = 83 + 34 = 117 ft., and join B″C″, which is the hydraulic mean gradient for the pipe BC.

The head at the point D = 400 − 150 − 83 − 79 = 88 ft.; and as the point E is 180 − 150 = 30 ft. above the point D, the available head at the point D = 88 − 30 = 58 ft.

Calculating, as in the last paragraph, the diameter necessary to discharge 24 gals. per minute at the point E = 2·277 in. A 2½-in. pipe would therefore be used for this branch also, and the loss of head for such a pipe would be 36 ft.

Make E′E″ = 162 + 36 = 198 ft., and join D″E″, which is the hydraulic mean gradient for the pipe DE.

An examination of the section will now show that the pipes at no point rise above their respective hydraulic mean gradients, and that the latter are not situated unduly above the former.

The velocity of the water in these pipes necessary to obtain the specified discharges must now be calculated.

Let V = velocity in feet per second.
„ G = discharge in gallons per minute.
„ d = diameter of pipe in inches.

$$\text{Then } V = \frac{G}{2\,d^2} \text{ (approximately).}$$

From this formula the velocities may be calculated, and are tabulated as follows:—

Section.	Diameter of pipe in in.	Discharge (gals. per min.)	Velocity (ft. per sec.)
A to B	4	72	2
B to D	3	54	2
D to F	2	30	3½
B to C	2½	18	1½
D to E	2½	24	2

These velocities are below 3 ft. per sec. (see Paper V.), with the exception of the section D to F. It will be remembered that the point F was 1 ft. below the hydraulic mean gradient. Taking both these circumstances into account, it would be advisable to increase the diameter of the pipe from D to F to 2½ in. This alteration will reduce the velocity in this section to 2½ ft. per second, and will raise the hydraulic mean gradient at F to 92 ft. above it. The system may now be considered satisfactory.

Supposing that at any point the line of pipe had risen above its hydraulic mean gradient, then the pipes preceding that point would have to be enlarged to such an extent as would raise the hydraulic mean gradient above the pipe at that point. As an alternative the line of pipe may be lowered by means of a tunnel or deep cutting, but this is rarely economical or expedient.

In calculating the diameters of the various pipes necessary to afford a stated supply at a given point, the head required at the point to be supplied must be taken into account. Supposing the level of the source of supply to be 500 ft. above a certain village, but that a head of 100 ft. is required at the village itself, to force the water to the top stories of the houses, or for fire-extinguishing purposes, then the available head upon which the diameter of the pipe leading from the source to the village must be based will be only 500 − 100 = 400 ft.

In calculating the diameters of the pipes from the maximum daily rate of supply, a certain minimum must be observed. For instance, a branch may be laid to supply a block of three cottages containing a population of fifteen people. Allowing 10 gals. per day for each person, the average daily rate of flow to afford this supply would be ·104 gals. per minute. Trebling this for a maximum daily supply would give ·312 (or less than ⅓ gal. per minute), and the time taken in filling an ordinary 3 gal. bucket would be nearly ten minutes. A system should be arranged so that a discharge at a rate of 3 gals. per minute may be obtained at each connexion. At farm-houses, where the water is used for refrigerating the milk, a supply of at least 3 gals. per minute is required.

On the other hand it is frequently necessary to lay down a branch main of considerably larger diameter than would be necessary to afford the requisite supply. As this often leads to waste of water (especially where the place to be supplied is isolated), which may interfere with the hydraulic mean gradients of the entire system, reduced fittings may be enforced, or the supply may be regulated by a sluice valve under the sole control of the undertakers, fixed at the termination of the branch. The following formulæ will enable the engineer to calculate the amount of reduction necessary:—

Let G = discharge in gallons per minute.
„ l = length of branch in yards.
„ d = diameter of branch in inches.
„ d_1 = internal diameter of tap in inches.
„ h = total head in feet.
„ h_1 = head consumed by friction in branch.
„ h_2 = head consumed by a screw-down tap fixed at the termination of the branch.

Then $h = h_1 + h_2$
and let $d_1 = r\,d$

Then assuming that the obstruction to the flow of the water caused by the tap is the same as in the case of short tubes (not less in length than twice the diameter of the orifice), the area at the point of greatest contraction will be ·81, the area of the passage through the tap.

$$\text{Then 1.—} h_1 = \frac{r^4 l}{1{\cdot}394\,d + r^4 l} \cdot h$$

$$\text{„ 2.—} h_2 = \frac{1{\cdot}394\,d}{1{\cdot}394\,d + r^4 l} \cdot h$$

$$\text{„ 3.—} G = \sqrt{\frac{(3\,d)^5 + h}{l} \cdot \frac{r^4 l}{1{\cdot}394\,d + r^4 l}}$$

As the calculations from which the diameters of the mains and branches of a water-works are obtained are based upon the results of the preceding levelling operations, a few words upon levelling may not be out of place. In the first instance, the engineer should never neglect to test his level before commencing work. The testing need not extend further than to prove that the level will "reverse" truly, and that the line of sight lies in the plane of collimation.

If, when the instrument has been set up, the bubble does not remain stationary in the middle of the tube on the level being revolved, the error must be rectified half by raising or lowering, as the case may require, the level by means of the capstan-headed screws, and half by the parallel plate-screws.

If, however, the level, after the most careful adjustment, refuses to reverse correctly, it should be sent to the makers. In the meantime, the bubble should be centred at each reading by means of the plate-screws.

To adjust the level for collimation, select a fairly level piece of ground and measure out three chains, and place pieces of flat stone or slate for the staff to rest upon at the commencement and terminations. Call these A B C D. Set up the level at B and read the staff on A and C. This will give the true difference of level between A and C, as the errors of adjustment would be the same on either side, the distance being equal, and would neutralise each other. Then set up the level at D, and read the staff again on A and C. If, on comparing the last reading with the previous ones, the difference of level between A and C is the same in each case, the level is in adjustment. If, however, the second operation does not agree with the first an error is present. This error is proportional to the length of the sight, and is, therefore (in the second operation), three times as great on A as on C; half the error in level being the error due to one chain in distance. This error must be corrected by raising or lowering, as the case may require, the cross-hair of the level by means of the collimating screws, until the readings of the staff when placed on A and C give the same difference of level whether the instrument be set up at B or D.

Always read each sight twice—the second time after booking. In turning the level on its axis, always turn it the way of the sun, otherwise it may become unscrewed, which would cause error and probably serious delay.

The necessary data include the following:—Yield and permanency of source. Quantitative analysis of water. Sanitary survey of source. Lengths of mains and branches. Population to be supplied. Rate of supply per head. Levels. Cross sections and particulars of streams, &c., to be crossed. Additional supplies for trade, dairy, or compensation purposes. Names of owners and occupiers and rateable value of land to be interfered with. Nature of ground to be excavated. Quality of local building materials and labour. Prices of manual labour and horse-hire. Facilities for transit. Particulars as to quantities of water used for mills, &c., in connexion with which claims may be made.

GENERAL BUILDING NEWS.

GYMNASIUM, RYDAL MOUNT SCHOOL, COLWYN BAY.—The new gymnasium, Rydal Mount School, Colwyn Bay, for Mr. T. G. Osborn, M.A., J.P., is being erected from the designs and under the superintendence of Mr. T. E. Lidiard James, architect to the school, London, the builder being Mr. J. B. Jones, of Colwyn Bay.

THE BUILDING TRADE IN ABERDEEN.—In consequence of the financial disturbances in Australia and America, and the resulting desire to find safer investments at home, the selling price of buildings in Aberdeen advanced considerably last spring, while feu-duties and ground-rents were pretty freely bought at thirty years' purchase. This gave an impetus to fresh building, and during this year, so far as it has gone, the Town Council has had more plans submitted for sanction than ever before in the history of the city in the course of a like period of time. From the January to the August meeting that body approved of the plans of 174 dwelling-houses, 4 blocks of shops and dwelling-houses, 20 workshops, 6 cottages, 13 public buildings (including rebuildings and additions), 2 hotels, 30 miscellaneous buildings (including sheds, offices, stables, and small warehouses), and 34 alterations and additions to various premises. The plans of 20 dwelling-houses in one street were disapproved of until the width of the back lanes be made satisfactory. The majority of the buildings described as "dwelling-houses" will accommodate six families, and the "cottages" two families. Many large contracts are still unfinished. The activity alluded to led, as was expected, to the success of the men in the joiners' strike at the commencement of the year on the subject of by-laws and against a threatened reduction of pay, and the standard wages remain at 7½d. an hour. This is also the figure for masons. Employers advertising for both builders and hewers find difficulty in getting them, and some of the former class of workmen receive 8d., or even 9d., an hour. Taking advantage of the "boom," the granite quarry-owners in the neighbourhood advanced the price of stones. Between the rise in the value of materials and labour, the cost of building has increased at least twenty per cent. on an average, compared to that ruling four years ago. Finding this on opening estimates, numbers of gentlemen who contemplated building residences for themselves have abandoned

their intention meantime, and it is understood that speculative builders erecting large dwelling-houses in "lands," recoup themselves to a considerable extent by the profit made on sales, when they split up the areas taken out by them into individual sub-divisions at higher ground-annuals than the rate of feu-duty paid by themselves. The number of plans lodged with the Town Council is therefore not an absolutely exact criterion as to the amount of building likely to go on in the city; while the doubling of the line to Culter, about seven and a-half miles distant on the Deeside railway, and the establishment of a suburban train-service on the branch, is leading to a good deal of house-building in that beautiful district, where granite stone, of a good colour, can be got comparatively cheap. The monumental and ornamental granite trade is still handicapped, contrasted with what was the case before the McKinley Act, and the recent Tariff reform, though it has put matters on a better footing for the granite merchants in Aberdeen, will not produce its full effect till business generally improves in the United States.

WORKHOUSE, PATRICROFT, LANCASHIRE.—On the 5th inst. Mr. J. Bingham, chairman of the Barton Board of Guardians, opened the new workhouse at Patricroft. The total cost of the buildings, exclusive of the land and properties, is 20,000*l.* The site, including that of the old workhouse, covers an area of over six acres. The new workhouse when completed will afford accommodation for about 500 inmates. It has been found desirable to erect the new premises in sections, and those already completed comprise the administrative block, the wards for the aged, infirm, and able-bodied inmates, and the tramp wards. The old workhouse is to be transformed into a temporary hospital. Messrs. Mangnall & Littlewoods are the architects.

MERCERS' SCHOOLS, BARNARD'S INN, HOLBORN.—The Mercers' Company in 1892 purchased the site of Barnard's Inn, Holborn, an area of 27,000 ft. superficial, including the buildings standing thereon, for the purpose of erecting a new school. Amongst these buildings was the Old Inn Hall, which the company decided to retain and make it part and parcel of the new school premises. The new school is faced with red bricks, with Ancaster stone dressings. There are two entrances to the main block of buildings, and one of these is surmounted by a clock tower. The Old Inn Hall has been retained and redecorated, to be now used by the boys as a dining-room, and with this object kitchens, sculleries, &c., have been built in close proximity. The head master's room is adjacent to the dining hall, and then the main block of buildings follow—with its large assembly hall on the ground floor, a room 70 ft. by 40 ft., with an arcade on its western side. On the same floor a large lecture room is provided, and also the physical laboratory and science master's room, and a special class-room for the head master. On the first floor are six large class-rooms, and the second floor has a similar number. These rooms are lighted from the left-hand side, with glass screens to the corridors. They are fitted with open warm air stoves, and the larger rooms and all the staircases and corridors are heated with low pressure hot-water, which is also used for extract purposes in a large trunk placed on the roof. Under the lecture-room block a covered playground has been provided for the boys' use in bad weather. A separate building of three floors, placed backing into Fetter-lane, contains the chemical laboratory and the drawing school. The whole of the buildings are fireproof throughout, and they have been fitted both with fire hydrants and with the electric light, no gas mains being introduced into the premises. The total accommodation is for 300 boys, exclusive of the lecture-room, laboratory, and drawing-school. The class-rooms are being fitted with single desks, and a separate locker is provided for every boy's hat and coat. The whole of the lavatories are situated in a distinct building in the playground. The builders who have carried out the works are Messrs. E. Lawrance & Sons, of Wharf-road, City-road, from designs prepared by Mr. T. Chatfeild Clarke, under whose personal direction and that of his son and partner, Mr. Howard C. Clarke, the buildings have been erected. Mr. J. P. King has acted as clerk of the works. Fittings and furniture were supplied by Messrs. G. M. Hammer & Co.

SCHOOLS, DERBY.—The new schools which have been erected in Devonshire-street, in connexion with St. Peter's Church, Derby, were opened on the 5th inst. by the Archdeacon of Derby. The contract for the work was placed in the hands of Messrs. Walker and Slater, and the plans, &c., were prepared by Mr. Lloyd, of Birmingham. The building is of best pressed bricks, but to about the height of four feet from the ground the walls are faced with glazed bricks, both inside and out. On the ground floor is a large school-room, which can be divided by means of a roller partition. Adjoining the infants' room are lavatories, a cloak-room, and an apartment for cooking, &c., with a pantry. Underneath these rooms are cellars containing hot water apparatus for heating purposes. The stairs leading to the upper school-rooms are fitted with Hawke's patent treads. Upstairs, one large school-room is 54 ft. long, by 20 ft. wide. It contains eleven windows. A second room is 26 ft. long by 22 ft. wide, and a third apartment 30 ft. long by 21 ft. wide,

CHANCEL, ALL SAINTS' CHURCH, NEWTOWN LINFORD, LEICESTERSHIRE.—At All Saints' Church, Newtown Linford, an old gallery has been taken away and a new chancel and north aisle built, at a cost of a little over 600*l.* The architects are Messrs. Roberts and Simpson (Leicester), and the contractor, Mr. Mason (Kirby).

HOSPITAL, BIRKENHEAD.—The new hospital which is being erected by the Birkenhead Corporation, from the plans and under the superintendence of the Borough Engineer, Mr. C. Brownridge, is now nearing completion. It is being warmed and ventilated by means of Shorland's patent Manchester stoves, with descending smoke flues.

NEW POST OFFICE, LIVERPOOL.—On the 10th inst. the Duke and Duchess of York laid the foundation-stone of the new Liverpool Post Office. To Victoria-street the façade will be 280 ft., to Sir Thomas-street and Stanley-street over 300 ft. in each instance. The material of which the building will be constructed will be Portland stone. The architect, Mr. Henry Tanner, has adopted the style of the French Renaissance. The front to Victoria-street, says the *Liverpool Post*, will be adorned by sixteen sculptured figures. Two of these, in a sitting posture, will be placed immediately over the main entrance. On either side of this will be four pillars of Shap granite 18 ft. high. The height of the doorway will be 14 ft. As to entrances there are six. Passing to the interior, the public entrance gives access to a vestibule 20 ft. by 16 ft. From this, turning to the right and left, the public office is reached, an apartment 72 ft. by 67 ft. Like the vestibule it will be lined with polished pillars and panels of Hoptonwood stone. Behind the public office, and lighted from the interior courtyard, will be situate the office for the transaction of registered letter business, and to the right, from Victoria-street, a telephone-room. The remainder of the ground floor will practically be occupied by the parcels and sorting offices. The parcels office, facing Stanley-street, is designed to be 222 ft. long by 70 ft. wide; with an annex or alcove passing round to the rear of the building. The sorting office is even arger, occupying the ground floor area fronting Sir Thomas-street. A feature of both these offices will be the pillars supporting the subdivisions on the floors above. The main support of the roofs and of the floors throughout will consist of steel girders; in the basement every provision has been made for convenience. The messenger entrance gives access to a staircase which descends to an office (at the corner of Victoria-street and Stanley-street) for the delivery of telegrams. At the rear of the buildings are placed the boiler-house and engine-room, for the electric light (which will be used throughout), the hydraulic lifts, and the heating appliances. Stores and kitchens are also provided for. The general lavatories and conveniences are in the base of the interior court, and are ventilated up to the roof by Kershaw & Lancaster's patent extract ventilators. The same ventilating system will be applied to the entire building. Lighted from the court, are on either side two strong rooms. On the first floor is a corridor, 280 ft. in length running parallel with Victoria-street, and having at either end a staircase leading to entrances in Stanley-street and Sir Thomas-street respectively. From this corridor, the windows of which look into the inner court, open the principal departmental offices. At the west or Stanley-street end, however, it widens out into a hall, on the Victoria-street side of which are situate the offices of the postmaster, attainable also from Victoria-street by a private entrance and stair. This stairway will be panelled with Hoptonwood marble. Other offices on this floor are the public inquiry office, the correspondence office, and the offices of the district surveyors. At the Sir Thomas-street end is situate the returned letter department; next to it, with frontage to Sir Thomas-street, the postal stores, and next a room of 108 ft. by 61 ft. for postmen. Opening from the latter are the postmen's kitchen and access to lavatories, placed at the back of the building. From the hall, down the Stanley-street side, are rooms for superintendents, examination of candidates, medical officer, engineers' offices, and board of works offices. The staircases at the ends of the corridor, as well as a stair from the telegraphist's entrance in Stanley-street, lead to the second floor. This is appropriated exclusively to the telegraphists. In the front of the building overlooking Victoria-street is the instrument-room, 280 ft. by 68 ft. There are separate large dining-rooms for male and female telegraph clerks, a telegraph school, offices for the telegraph superintendents, and a telegraph stores. In addition, cloak-rooms, lavatories, &c., are provided. The walls of the latter will be faced throughout the building with ivory white glazed bricks, made by Dennis, of Ruabon; the lavatory fittings will be by Doulton and Finch, of London. The kitchen and domestic offices for the convenience of the telegraphists are situate on the top floor over the dining-rooms. The larger portion, however, of the top floors will be occupied by the battery-room, which extends the whole length of the principal front, and partly along the Sir Thomas-street frontage also. Workshops for the electricians and other general offices are planned adjoining. The roofing will be of Buttermere and Penrhyn slates. Internally, the woodwork of doors and windows will be of teak. The glazing is to be executed in the method patented by Messrs. Mellowes, of Sheffield. All the floors will be fireproof, and asphalted by Mr. Roger Lowe, of Farnworth. Up to the present the general contract for the building has not been let, but the removal of buildings on the site, together with the excavating of the foundations, putting in the foundation walls, erection of coal vaults, &c., has been carried out by Messrs. W. Thornton & Sons, of Liverpool. The Board of Works are represented on the spot by Mr. G. H. Wolven, clerk of works.

SANITARY AND ENGINEERING NEWS.

SANITARY IMPROVEMENTS, MALVERN COLLEGE.—The sanitary improvements which have been recently carried out at Malvern College under the direction of Mr. J. Willcox, C.E., of Birmingham, are now completed, embracing a reorganisation of the whole of the drainage system and sanitary arrangements, at all the College buildings, and each of the masters' houses in the College grounds. The undertaking necessitated the employment for several weeks of some 200 men, including forty plumbers, and was completed without having to close the College. The whole of the plumbing was carried out by Mr. E. France, of Birmingham, and the greater portion of the drainage by Messrs. Wood & Loach, of Handsworth; whilst the structural alterations, new sanitary blocks, and part of the drainage were executed by Mr. T. Broad and Mr. W. Porter, both of Great Malvern. The sanitary specialities, urinals, latrines and lavatory ranges, &c., were by Messrs. Adams & Co., of London, the school lavatories being of white glazed ware, and the urinals consisting of white glazed angular backs, with glazed ware capping and base combined, in one piece, and special corrugated drip-tiles. The flushing grease traps and drain interceptors were supplied by Messrs. Dent & Hellyer, of London, and the pedestal closets used were Twyford's Deluge M. Messrs. W. J. Williams and T. R. Day acted as clerks of the work.

SEWERAGE DISPOSAL, RIPON.—On the 7th inst. Mr. Frederick Herbert Tulloch, M.Inst.C.E., an inspector of the Local Government Board, held an inquiry at the Town Hall, Ripon, with respect to an application by the Ripon Corporation for sanction to borrow 19,000*l.* for purposes of sewerage and sewage disposal, and 1,050*l.* for works of street improvement. The Town Clerk (Mr. M. Kirkley) appeared for the Corporation, with Mr. A. E. Preston, of Bradford, the engineer for the works. Mr. T. Kidd, sanitary inspector, Mr. W. Edson, city surveyor, were also present. Mr. A. E. Preston afterwards explained the plans in detail, pointing out the site of the proposed sewage works about a mile east of Ripon at the confluence of the rivers Ure and Skell. The whole of the intercepting sewers were new, but in the city the new sewer would replace existing ones in most places. The population of Ripon in 1881 was 7,390, and in 1891 7,512. The sewerage works were designed for a population of 10,000. The area of ground for the works was 30 acres, an additional 5 acres being obtained from land the property of the corporation, beyond the 24½ acres referred to by the Town Clerk. Mr. Preston considered that 25 acres would be sufficient to lay out at present in a scheme of intermittent downward filtration. A plan of the beds was presented on to which it was proposed to deliver the sewage at 63·0 ft. above ordnance datum. There were affluents along the bank of the river for the discharge of water. The nature of the subsoil was sandy loam to a depth of 3 to 5 ft., with a lower stratum of gravel. No chemicals would be used. In order to meet floods a considerable bank would be placed round the ground. The inspector afterwards visited the site of the proposed sewerage works and the roads to be widened.

THE THIRLMERE WATER SCHEME.—At a meeting of the Manchester City Council on the 5th inst., Sir John Harwood announced that the recent heavy rainfall had brought so much water into the lake at Thirlmere, that the 20 ft. level had been reached. For this reason the Waterworks Committee had considered whether it would not be advisable to bring the water to Manchester earlier than was anticipated. It was proposed to open the works next month, and to invite the Prince of Wales to perform the opening ceremony at Thirlmere, which is about one hundred miles from Manchester. The Council concurred in the proposal.

IMPROVEMENTS ON THE BRIGHTON MARINE FRONTAGE.—At an estimated cost of 47,000*l.* works for the defence and improvement of the Brighton Marine Front are contemplated by the Brighton Town Council. The scheme comprises the erection of groynes and retaining wall at Black Rock; corresponding improvements at the western extremity of the sea shore; and the extension of the Madeira Terrace and Colonnade as far westward as the Chain Pier. The Borough Engineer and Surveyor is Mr. F. J. C. May.

SEWERAGE SCHEME, MONMOUTH.—A special meeting of the Monmouth Town Council was held on Tuesday, when it was decided to engage Mr. Lailey, C.E., Westminster, to carry out the sewerage scheme, up to the delivery at the pumping-station, and Messrs. Bramwell & Harris, London, are engaged to complete the purification scheme, &c., and to prepare specifications for the electric installation.

FOREIGN AND COLONIAL.

FRANCE.—The jury commissioned to decide the competition for the monument to be erected at Havre to the memory of Admiral Mouchez, has awarded the first premium to M. Ernest Dubois, sculptor.——M. Coulon, who was commissioned to execute, for the Department of Fine Arts, the bust of the late architect M. Bailly, has also been selected to execute the statue of Théodore de Banville intended for the town of Moulins.——The inauguration of the monument to Duban, the eminent architect, executed by M. Guillaume, is to take place at the École des Beaux-Arts on October 5.——A subscription has been opened to erect a monument at Amiens to the late President Carnot, who during eight years exercised in that town the functions of Ingénieur des Ponts et Chaussées.——Some important restoration work has just been completed at the Church of Saint Philippe du Roule. The vault has been decorated with a number of medallions executed by M. Aubrun, the mural paintings are by M. Vivier, and the figure subjects for six new windows have been executed by M. Champigneulle from the cartoons of M. Albert Maignan.——The subscription opened in the department of La Vendée to raise, at Roche-sur-Yon, a monument to Baudry, the painter, has not been very successful, and it is proposed to raise the remainder of the funds required by a new exhibition of the painter's works at Paris, under the management of M. Bouguereau.——A Hôtel de Ville is to be built at Dunkerque, the design to be selected in public competition. The style is to be Flemish Renaissance, and it is proposed to spend about 1,500,000 fr. on the building ——M. Marcel Jacques, sculptor, has been commissioned by the Municipality of Cherbourg to execute a monument to F. Millet, the painter, to be erected on the Place de Gréville.——On Sunday the 16th a monument is to be unveiled at Enghien to Villemessant, the journalist, and founder of the *Figaro*.——The death is announced of M. Léopold Amédée Hardy, Government Architect and officer of the Legion of Honour. He died at Châtellon-sur-Loing, at the age of sixty-five. M. Hardy was a pupil of Nicolle and a student of the Ecole des Beaux-Arts. He had been Diocesan Architect at Nancy, Albi and Cambrai, and had carried out some important religious edifices, among which may be mentioned the façade of the church at Presles (Seine-et-Oise), the church at Colmey (Meurthe-et-Moselle), and the church "Du Rosaire" at Lourdes, as well as the approaches to that remarkable building, of which we gave an illustration in the *Builder* of Jan. 14, 1893. Among civil buildings executed by him may be mentioned the College de Romans (Drôme), the restoration of the Ecole de Pharmacie, and the building of the Institut Agronomique, at Paris. In 1862 M. Hardy was sent to London as architect in connexion with the French section of the exhibition of that year. He became subsequently Directing Architect of the exhibitions of 1867 and 1878 at Paris.

GERMANY.—The Emperor and Empress were present at the unveiling of the Emperor William's monument, which recently took place in Königsberg. The statue of the Emperor is in bronze, by Professor Reusch. Speaking at the subsequent banquet, His Majesty mentioned that during his reign over eighty-five millions of marks had been spent by the Government in the province of East Prussia on railways, dykes, the regulation of the Vistula, canal construction, and other beneficial engineering works.——The Emperor, it is expected, will be present at the opening for navigation through Berlin of the canalised Spree. By means of the now completed deepening of the channel the largest Elbe and Oder boats will be able to pass through the city. The last piece of work yet to be done is the removal of the pillars of the old Kurfürsten Bridge.——An artificial ice skating-rink is to be constructed in Berlin on the same system as that adopted in London and Paris. The estimated cost of building and machinery is 15,000*l*.—The works on the new Victoria Park have already cost the municipality about 142,000*l*., of which 100,000*l*. was for purchase of land and rights.——The plans for an overhead electrical metropolitan railway, in opposition to the Siemens' scheme, running through the south of the city, is being considered by the municipality. This line would run from the Silesian terminus to the Zoological Garden. We wonder that no English firm has as yet tried for the job.——Blocks of copper "slack" are being experimentally laid down between some of the tram lines. It is claimed that this paving affords a better grip than either asphalte or wood.——An International Heraldic Exhibition is to be held in November in the Arts and Crafts Exhibition. Professor Hildenbrandt is receiving the applications for space.——The public are now admitted to view Professor Encke's sarcophagi of the late Emperor William and his consort at the Charlottenberg Mausoleum. On entering attention is arrested by a colossal angel in white marble, who, with sword and buckler, warns off the intruder. The most successful figure is undoubtedly that of the Empress, who is most naturally depicted in deep sleep. A good comparison between modern realism and the idealism of the first part of this century is afforded by the contrast with Rauch's neighbouring sarcophagus of Queen Luise.——At the Strassburg Architectural and Engineering Congress, Herr von Schraut stated that Alsace has spent 23,000,000 marks on Rhine regulation since 1870.——The bronze groups for the fountains on the Albert Platz at Dresden have recently been unveiled. The sculptor is Robert Diez.——A monument to Basedow is to be erected at Dessau according to the designs of the architect Rathke.——The King of Saxony has presented the German National Museum at Nuremberg with a large plaster cast of the monument to Frederick the Wise (Elector of Saxony, 1525), in the Schlosskirche at Wittenberg. The original is the work of Peter Vischer of Nuremberg, bearing the date 1527, and represents the prince life size in his electoral robes. Another cast is destined for Stuttgart, and a third for the Albertinum at Dresden.——The Redemptorists have purchased a plot of ground near Saargemünd for 3,000*l*. with a view to the erection of a monastery there.——In the course of the construction of a wharf on the Main canal at Hanau the northern end of the Roman Main bridge was laid bare. Most of the coins found date from 81-117 A.D.——By the discovery of a Roman Castellum in the burg of Friedberg, Herr Kofler, the District Commissioner for Hesse, has solved one of the most important problems of the *Limes* Investigations, viz., the fortification of the angle running out northwards from the Saalburg and Gross Kotzenburg to the neighbourhood of Giessen. Professor Dieffenbach, who died there in 1862, had already shown that Friedberg, from which Roman roads radiate in all directions, had been a Roman settlement, but it remained for Herr Kofler to find the first real traces of the Roman fort. These were parts of a Roman gateway, which he assumes to be the "Porta Decumana." He also located the north-eastern corner of the Castellum, and the south-eastern corner, which practically coincided with the present boundaries. Hence the ancient castellum was practically of the same dimensions as the Burg or 244 by 154 mètres.

AUSTRIA.—The monument "In commemoration of the delivery of Vienna from the Turks in 1683," which is to be unveiled next month is now being put up. The monument represents Rüdiger von Starhemberg on horseback surrounded by types of the defenders of Vienna, above whom floats the Goddess of Victory, Around this group are statues of Bishop Kollunik, Burgomaster Liebenberg, and the "Saviours" of Vienna, to wit Sobieski, King of Poland, Max Emanuel, Elector of Bavaria, Johann George III., Elector of Saxony, and Charles VI., Duke of Lorraine. The architectural parts of the monument, which is the work of Professor Hellmer, are in red marble; the figures are in white Carrara marble.

RUSSIA.—According to the *Novosti* more of Prince Wittgenstein's estates in Russia have been sold recently, among them Smobewitchi for 1,300,000 roubles. The princess still retains the well-known residence of Werki, near Wilna, Naliboki, and Ljubtcha, the two latter properties have already been bid for on account of Finnish capitalists. Werki, with its magnificent palace and park, occupies the place of a hunting box built in the fourteenth century by the Lithuanian Prince Witen. At the end of that century Prince Jagello, who was also King of Poland, assigned Werki as a residence to the Catholic Bishops of Wilna, and it was one of these, Bishop Brzosowski, who built the castle and palace in the seventeenth century. The estate passed from Bishop Massalki to the Princes of Radziwill, and thence to its present proprietress.

SANITATION IN COPENHAGEN.—The Association of Landowners of Copenhagen has presented a scheme to the Corporation, which has been prepared by Herr Winslöw and Herr Hausen, engineers, for the solution of the problem of the removal of fæcal matter in the Danish capital. The Association maintains that the fæcal matter of the city is its property, and that it has, therefore, the first claim to settle this question. Nor will this proposal in any way arrest the introduction of water-closets, so greatly desired by a large portion of the inhabitants. It is proposed that the fæcal barrels shall be emptied every week, and that the latter shall be of steel, and air-tight, and be cleansed well after each emptying. The latrine is to be conveyed by special light railways to two stations, one being the existing station on the Ler Lake, and which will receive two-thirds of the production, and one on the Sound, which will take the remainder. An engagement is to be concluded with some contractors for the daily removal of the fæcal matter from these stations. Should an epidemic arise it is proposed to transport the entire product to the station on the Sound, where pumping machinery is to be mounted, which will pump the matter through a closed shoot into the deepest waters in the course of ten hours. The same course would be followed in case of any accumulation. The stations would be capable of storing the product of three days, and fitted with complete plant for cleansing and repairing the barrels, thawing the matter in winter, &c. The fæcal matter would be taken away by agricultural contractors, the farmers, and market gardeners around the town being ready to purchase it, particularly in its raw state, and free from water. The barrels are to be removed at night from dwelling-houses. If steel barrels can be procured the new arrangement would come into force by November 1, 1895, or some of the present wooden barrels would be made use of for a time. The cost of the entire undertaking is estimated at 48,500*l*., including a sum of 5,500*l*. as compensation to the present "Renovation" Company. This would be an average expenditure of 11s. per barrel a year. This scheme has been approved by 3,500 owners of house property in the city, and it will no doubt be adopted. A company has already been formed for removing the manure from the two stations, with a capital of 150,000 kr.

MISCELLANEOUS.

GLASGOW AND WEST OF SCOTLAND TECHNICAL COLLEGE.—The eight honours students in building construction who went to London in June for the practical design part of the Science and Art Department examination have all passed, a bronze medal and first-class certificate having been won by William M'Lauchlan. In the advanced there are 14 first-classes out of 29 passes; while in the elementary 39 students pass in the first-class standard and 10 pass "fair." In the art examination in architectural design all the students presented have passed—two excellent, one first and one second class. In architecture 10 students have passed, 6 obtaining first-class certificates. In the national competition a bronze medal is awarded to Albert H. Hodge for a design for a market and corn exchange. Eight other prizes are awarded for designs and for measured drawings of portions of Glasgow Cathedral. Two students, John Fairweather and James Lochhead, having passed the qualifying examination of the Royal Institute of British Architects, have been elected Associates. Messrs. Thomas S. Fraser and Thomas A. Moodie, distinguished honours students of the college and Queen's prizemen in the advanced stage of the Science and Art Examination in Building Construction, 1892, have been appointed assistants.

"OWEN JONES" PRIZE.—This competition was instituted, in 1878, by the Council of the Society of Arts, as trustees of the sum of 400*l*., presented to them by the Owen Jones Memorial Committee, being the balance of subscriptions to that fund, upon condition of their expending the interest thereof in prizes to "Students of the School of Art who, in actual competition, produce the best designs for household furniture, carpets, wall-papers and hangings, damask, chintzes, &c., regulated by the principles laid down by Owen Jones." The prizes are awarded on the results of the annual competition of the Science and Art Department. Six prizes were offered for competition in the present year, each prize consisting of a bound copy of Owen Jones's "Principles of Design," and a bronze medal. The following is a list of the successful candidates:—Fred. Appleyard, School of Art, Scarborough, design for wall-paper; Ernest G. Gillick, School of Art, Nottingham, design for lace curtain; Ernest G. Slater, School of Art, Scarborough, design for a damask; Constance T. Smith, School of Art, Glasgow, design for a printed velvet; Edwin Francis, School of Art, Durham, design for a carpet; Samuel Palmer, School of Art, Macclesfield, design for floor tiles. The next award will be made in 1895, when six prizes will be offered for competition.

PUBLIC WORKS IN CORUNNA AND VIGO.—According to a recent report of the British Consul at Corunna upon the Commerce and Trade of Galicia and Asturias, the project for supplying Corunna with pure drinking water was advanced a stage in 1893, the British Company—Corunna Waterworks Company—gave the contract for the works to Messrs. Bayliss & Son, a British firm who have been doing business in Spain for some time. Work was not commenced, the engineers of the company having discovered that the plans drawn up by Señor Yañer, the Spanish district engineer, as long ago as 1881, contained a mistake in the levels which would render the delivery of the stipulated quantity of water impossible. A fresh survey made by independent engineers confirmed the view taken by the engineers of the company, and the commencement of operations had to be deferred pending negotiations with the Spanish authorities. The error is not only a cause of great inconvenience to the British company and contractors, but to the inhabitants of Corunna, who continue to incur the risks to health resulting from an imperfect and impure water supply. The harbour works at Vigo progress, and are expected to be shortly completed. The iron pier is finished, and ships load and discharge alongside it. The contract for a railway between the pier and the railway station has been let to the Compañia de Ferro-Carriles de Medina del Campo a Zamora y de Orense a Vigo, who have made the requisite deposit, and it is expected will soon begin work.

THE ROMAN WALL.—The examination of Hadrian's Wall, promoted by the Cumberland and Northumberland antiquaries in conjunction with Professor Pelham and Mr. F. Haverfield, was carried on actively in both counties until the end of August, when the Cumberland excavations were suspended. Sections were cut in the vallum at various places, especially at Brunstock, Whitsmoss, Lanercost, and Greatchesters, with the result that its general system was laid open, and it was made plain that the mounds of this great earthwork were

COMPETITIONS, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITIONS.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
County Offices	Durham C. C.	200*l.* and 100*l.*	Nov. 30
*Museum for Antiquities, Cairo	Egyptian Government	First 600*l.* and 400*l.* between the next four	Mar. 1, '95

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered
Subways under Railways	Grimsby U.S.A.	M. Petree	Sept. 18
Sewerage Works, &c.	Melton Mowbray L. B.	E. Jeeves	do.
Sewers, Welch's Hill, Moor Green, &c.	King's Norton R.S.A.	Robt. Godfrey	do.
Pipe Sewer (1,070 yds.), &c.	Mexborough Local Bd.	W. A. Palliser	do.
School Buildings, Stainsby, Chesterfield	Ault Hucknall Sch. B.	Rollinson & Son	do.
Schools, Argyle-street	Ipswich School Board	F. E. Bisshopp	do.
Six Houses, Kingston-by-Sea, Sussex	Tottenham Loc. Bd.	G. Cecil Farr	do.
*Oats, Hay, Clover, and Straw	do.	*Official*	do.
*Erection of Public Library		P. E. Murphy	do.
Cottage Hospital, Bridgend, Glam.		Lambert & Rees	Sept. 19
Levelling, Paving, &c. Grove-road	Great Clacton Local Board	A. R. Robinson	do.
Alterations, &c. to School, Knowle	Bedminster (E.M.) Sch. Board	M. Froud	do.
Sewer Extension, Lowick-green	Ulverston U.R.S.A.	Jos. Greenwood	do.
Church, Heckmondwike		W. S. Barber	Sept. 20
House, Drum Farm, New Deer, Aberdeen	Geo. Muirhead		do.
Twine Spinning Factory, Ainslie-street, Grimsby	Grimsby & North Sea Steam Trawling Co.	*Official*	do.
*Cleaning and Painting Works, Peterboro', &c.	M. R. Co.	do.	do.
Exhibition Buildings, Cathay's Park, Cardiff		Edwin Seward	Sept. 21
Additions, &c. to Crown Inn, Crawley, Sussex		Wm. Buck	do.
Street Paving (various)	Burnley Corporation	F. S. Button	Sept. 22
Brick Chimney (45 yds. high), Brookfoot Mills, Brighouse, Yorks		Jackson & Fox	do.
Two Houses, Holmfield, Halifax		Medley Hall	do.
Sewer Work, Ballitore	Baltinglass (Ireland) Union Guardians	*Official*	do.
*Erection of Works, &c. Leeds District	H.M. Works	do.	Sept. 24
Chapel Lodge, &c. Nab Wood, Yorks	Shipley Local Board	S. Jackson	do.
Additions to Schools, Shaw Foot, Hethersgill, near Carlisle	The Rector		do.
*Low Level Sewerage Works	Hendon Local Board	S. S. Grimley	do.
*Broken Granite, Steam Rolling, &c.	Edmonton Loc. Bd.	G. E. Eachus	Sept. 25
Bridge Works over Neath Canal	Neath Dist. Highway Board	D. M. Davies	do.
Making-up Bramley-street, &c.	West Hartlepool Corp.	J. W. Brown	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered
*Paving Works	Willesden Local Board	O. Claude Robson	Sept. 15
Buildings and Chimney, Altham	Burnley Corporation	F. S. Button	do.
Five Tenements, Bain-square, &c. Calton	Glasgow Impt. Trusts.	*Official*	do.
Guernsey Granite	Dover T. C.	do.	do.
*Materials for Paving Roads, &c.	Greenwich Bd. of Wks.	do.	do.
*Heating and Ventilation of Municipal Buildings	Plymouth Corp.	J. Paton	Sept. 17
Two Schoolrooms, &c. Blaenllynfi, Maesteg, Wales	Cwmdu, &c. School Board	E. W. Burnett	do.
Police Station, Ashburton	Standing Joint Com.	E. H. Harbottle	Sept. 17
Two Wool Warehouses, &c. Square-road, Halifax		Raymond Berry	do.
Refuse Destructor, Buildings, &c. Corporation-yard	Brighton T. C.	F. J. C. May	Sept. 18
Drainage, Garlieston	Wigtown C. C.	Jas. Brand	Sept. 19
Cast-iron Pipes, &c.	Ramsgate Corp.	Wm. A. Valon	do.
Sewerage Works (1,245 yards), &c.	Padiham Loc. Bd.	Jno. Gregson	do.
Additions, &c. to Schools, Coley-street	Reading Sch. Bd.	Jos. Morris	do.
Street Works, Hamilton-street	Hoole (Chester) Loc. Bd.	C. A. Ewing	do.
Six Cottages, Springfield Wharf, Chelmsford		F. Whitmore	do.
Service Reservoir, Bruntcliffe	Morley Corp.	Chas. Gott	do.
*Refuse Destructor	Corp. of Dublin	S. Harty	Oct. 1
*Boundary Fence, Walls, &c. N.E. Hospital	Met. Asylums Board	A. & C. Harston	Oct. 2
*Sewer Works	Acton Loc. Bd.	D. J. Ebbetts	do.
*Waterworks	Redruth Loc. Bd.	H. B. Nichols	Oct. 6
*Supply of Materials	Gt. Western Railway	*Official*	Oct. 9
*Artisans' Dwellings, Abingdon	Governors, Christs' Hospital, Abingdon	J. G. T. West	Oct. 1
Pipe Sewers (5,500 yards)	Stow-on-the-Wold R.S.A.	G. B. Witts	Oct. 10
*Sewerage Works, Floodgates, &c.	Melton Mowbray Local Board	*Official*	No date
Two Shops and Houses, Church-street, Ilkley		C. H. Hargreaves	do.
Grit Setts (150 tons)	Manchester Corp.	*Official*	do.
*Rectory, Theydon Gamon, Essex		Bailey & McConnal	do.
Additions, &c. to Parish Church, Whittonstall, Northumberland		Crawford, Hick, & Wilkinson	do.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in by
*Instructor, Building Construction	Leyton Local Bd.		Sept. 18
*Instructor Plumbing	do.		do.
*Surveyor	Brentford Loc. Bd.	200*l.* &c.	Sept. 24
Clerk of Works	Stone Loc. Bd.		Sept. 22

Those marked with an asterisk (*) are advertised in this Number. *Competition, p.* iv. *Contracts, pp.* iv., vi., viii. *and* xx. *Public Appointments, pp.* xviii. *and* xx.

mainly excavated from its central ditch. Sections cut from the wall to the vallum showed the Roman military road in good preservation, and revealed also a paved footpath, or something very like it, close behind the wall. Of the "Gromatie ditch," so noticeable on the German limes, no certain traces were found, either in front of the vallum or in front of the wall; but this point, we understand, will be further prosecuted next summer. At Greatchesters (Æsica) the excavators attacked the south-west angle of the Roman fortress, and unearthed a well-preserved turret and several buildings of uncertain use, and ascertained further that the occupation of the camp had been once or twice interrupted, as was the case apparently with other camps along the Roman wall.—*Manchester Guardian.*

SYKES'S INTERCEPTOR.—This interceptor, of which a section is appended, merits attention at the present moment, when the question of ventilating the interceptor on the sewer side has received considerable prominence, as it provides especially for such ventilation. If it is not desired to use the outlet or extract, a screw plug can be inserted. The plugs are supplied with indiarubber washers. The intercepting chamber, with its half channel, is done away with, an alteration which, however, appears to have as many drawbacks as advantages. The inspection

SYKES' PATENT INTERCEPTOR

and cleaning of the house drain is certainly rendered much more difficult, and in the section shown the two inspection or cleaning branches are a good deal in each other's way. Still, it is a piece of sanitary ware worth attention. It may be questioned whether the air "inlet" to house drain should not rather be "outlet," the inlet being formed by the soil-pipe, so that the travel of the air is assisted, and not interfered with, by the closet discharge. The interceptor is manufactured by the Albion Clay Co.

LIGHTING OF THE BALTIC-NORTH SEA CANAL.—According to plans just published, the Baltic-North Sea Canal will be lighted entirely by the electric light. On either side of the canal, at intervals of 250 yards, glow-lamps of twenty-five candle power each are to be fixed on poles 12 ft. in height. The number of the latter will be over a thousand. The lock works are to be lighted by twelve glow-lamps, whilst the entrances will be marked by coloured glow-lamps visible from a long distance. Only where the canal runs through lakes the route will be marked with buoyed petroleum lamps. The entire plant is to be ready by April 1, 1895.

MEETINGS.

SATURDAY, SEPTEMBER 15.

Architectural Association.—Fifth Summer Visit, Kettering and Rushton Hall, Northants.

London and Provincial Builders' Foremen's Association (Memorial Hall, Farringdon-road, E.C.).—Monthly Meeting, 7.0 p.m.

TUESDAY, SEPTEMBER 18.

Glasgow Architectural Association.—Mr. G. Adam on "Art Metal Work." 8 p.m.

WEDNESDAY, SEPTEMBER 19.

Builders' Foremen and Clerks of Works' Institution.—Ordinary Meeting of the Members. 8.30 p.m.

RECENT PATENTS:

ABSTRACTS OF SPECIFICATIONS.

18,583.—WALLS, &c.: *A. Bruckner.*—According to this patent the walls are composed of plates. These plates are preferably provided with grooves upon their vertical edges, and with a central channel or perforation. They are then so joined together and placed on each other that the grooves at the edges coincide so as to form a continuous passage, traversing the whole height of the wall. These passages are filled with a liquid cement, a part of which also penetrates between the horizontal joints and effects of the firm connexion of the plates.

18,615.—FLAP VALVES: *H. G. S. Ham.*—In order to regulate the flow of sewer air, gases, &c., through drains or culverts, a flap made of aluminium or aluminium alloy, is hung as a valve flap.

23,012.—SLIDING WINDOWS: *J. L. Stephenson and another.*—The improvements are designed to allow of the window being cleaned or glazed from the inside of the building. Loose wooden slides fitted longitudinally afford the means whereby the sashes may be slid and turned. Owing to the method of mounting, the windows may be employed as ventilators, the fixing allowing them to be placed at any desired angle by means of set screws.

23,875.—IMITATION STAINED GLASS: *E. E. Pils.*—A long specification describes the method of producing transferable pictures which possess the plasticity of colour peculiar to stained glass, and also the peculiar reflecting property of stained glass, with a resistance to the deteriorating effects of light on ordinary diaphinies.

3,743.—GULLIES, &c.: *G. J. & M. Clarke.*—The improvements consist in a dish brick or gully block for sinks and the like. Two inlets are formed, right and left hand, leading into channels to the grate, so that the block is reversible and is capable of being used right or left hand respectively.

9,241.—BUILDING BLOCKS, &c.: *J. C. Sellar.*—Minerals, metallic substances, or compounds of same are combined and formed into a type of stoneware, being pressed into moulds, &c., to form building blocks or other appliances.

10,035.—PAVING BRICKS: *J. H. Fox.*—To prevent trouble in laying the paving bricks are provided with diagonal grooves. In laying they break joint in the same manner as smooth bricks, the grooves, however, extending across the stall to the central channel or gutter.

12,651.—IMPROVEMENTS IN HINGES, &c.: *A. Paillet.*—This invention consists essentially in the use of metal balls or rings to reduce the friction specially applicable to the ironwork of doors or gates of large size. The pivot or support consists of balls always immersed in oil and protected from dust, &c., by a cover. The friction is reduced till the working is very smooth and easy, with great strength and stability.

NEW APPLICATIONS FOR LETTERS PATENT.

AUGUST 27.—16,297, G. Bray, Reflecting Gaslights.—16,302, W. Ebel, Wall Decoration.—16,312, A. Shaw, Mortising or Routing Machines.—16,332, W. Morris, Roofing and Wall Tiles.—16,344, A. Dawes, Window-sash Fasteners.

AUGUST 28.—16,367, A. Mokaiesh, Window Clip.—16,381, J. McLintock, Quick Drying Anti-Fouling Paint.—16,429, C. Fisher, Cutting and Moulding Machines.

AUGUST 29.—16,447, E. Taylor, Fireplaces and Chimney Flues.—16,457, W. Couper, Firegrates, &c.—16,465, W. Hodgson, Water-closets.—16,480, J. Halse & O. Reece, Sash- and Door-fasteners.

AUGUST 30.—16,500, C. Josh, Glazing and Securing Glass in Frames.—16,507, R. Frame, Fixing Door Handles to Spindles.—16,549, J. Gorman, Stone-workers Gauge Squares.—16,564, E. Clare, Fasteners for Sashes, Sliding Doors, &c.

AUGUST 31.—16,575, W. Peyton, Stove or Fire-grate.—16,577, T. Robb, Lowering and Raising Window-sashes.—16,581, H. Hayes, Roofing Tiles.—16,593, A. Brue, Heating Dwelling-houses, Halls, Chambers, and other interiors by Hot-water.—16,602, C. Woossam, Gate Spring.

SEPTEMBER 1.—16,646, S. Dand, Window-sash Fasteners.—16,654, J. Sheppard and F. Dashwood, Continuous Concrete Structures.—16,689, W. Kimberley, Plough and Phillister Planes.—16,701, J. Roper, Device for holding pipes while joining same.—16,713, K. Kreidmayr, Closet Seat or Cover.

PROVISIONAL SPECIFICATIONS ACCEPTED.

13,889, C. Lea, Simplex Door-handle.—14,561, E. Flower and H. King, Ventilators.—14,812, A. Phelps, Window-sash Fastener.—15,094, A. Helwig, Closed arrangement for Gates and Doors.—15,102, R. Haddan, Chimney Cowls.—15,678, R. and D. Craine, Bakers' Ovens.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.)

16,588, H. Dean and J. Edwards, Drain-channels and

Traps.—18,026, J. Clayton, Window Frames and Sashes.—18,455, A. Holmes, Handsaws, &c.—19,870, S. Briggs, Indicating heat sn buildings from distant points.—19,039, A. Mack, Composite Boards or Slabs for building purposes.—20,253, W. Waters and F. Stone, Preseruative Coating for iron and steel.—20,566, W. Osment, Creating tenons on the ends of rails or door and other like frames.—21,101, P. Winn, Flushing Cisterns, &c.—14 457, C Thompson, Vapour Burners or Plumbers' Torches.—14,599, E. Groebe, Preservation of Wood.—14,605, A. Ewens, Automatic Sash Fastener.

SOME RECENT SALES OF PROPERTY:

ESTATE EXCHANGE REPORT.

SEPTEMBER 4.—By *Green & Pilditch*: 16 and 17, St. Mark-st., Whitechapel, u.t. 36 yrs., g.r. 8*l.* 15s., r. 65*l.*, 1,060*l.*; 28, Newnham-st., u.t. 36 yrs., g.r. 4*l.* 7s. 6d., r., 33*l.*, 475*l.*

SEPTEMBER 5.—By *B. Brown*: 1 to 15, Antcliff-st., Stepney, u.t. 33¾ yrs., g.r. 41*l.* 14s., 3,375*l.*; 3, Bromehead-rd., u.t. 33¾ yrs., g.r. 2*l.* 10s., 105*l.*

SEPTEMBER 6.—By *Phillips, Lea & Davies*: F. stabling and premises, area 2,268 ft., Tenter-st. West, Whitechapel, 1,840*l.*—By *E. Evans*: The lease of No. 232A, York-rd., N., u.t, 18 yrs., with plant and machinery, &c., and letters patent, 250*l.*—*F. J. Bisley & Sons*: 24, Southwark-pk-rd., Bermondsey, u.t. 26 yrs., g.r. 4*l.*, r. 32*l.*, 215*l.*; 17, Balaclava-rd., u.t. 30 yrs., g.r. 4*l.*, 205*l.*; 53, 55, Camilla-rd., u.t. 41 yrs., g.r. 8*l.*, r. 65*l.*, 505*l.*—By *C. C. and T. Moore*: 6 to 18 even, Bromehead-st., Commercial-rd., E., u.t. 33¾ yrs., g.r. 17*l.* 10s., r. 197*l.*, 1,420*l.*; 20 to 42 even, Bromehead-st., u.t. 36¼ yrs., g.r. 36*l.* 5s., r. 294*l.*, 2,280*l.*; 4, Bromehead-rd., u.t. 33¾ yrs., g.r. 1*l.* 15s., r. 10*l.* 9s., 110*l.*; 5, Bromehead-rd, u.t. 36¼ yrs., g.r. 1*l.* 15s., r. 12*l.* 9s., 110*l.*; 1A and 30A, Antcliff-st., u.t. 33¾ yrs., g.r. 3*l.* 10s., r. 28*l.* 1s., 220*l.*; 1 to 12 Newbold-st., u.t. 33¾ yrs., g.r. 32*l.* 5s., r. 274*l.* 18s., 2,160*l.*; 13 to 21, 14A and 24, Newbold-st., u.t. 36¼ yrs., g.r. 36*l.* 5s., r. 237*l.* 10s., 1,890*l.*; 1, Nile-st., Hoxton, and 31, Alma-st., u.t. 40½ yrs., g.r. 7*l.* 15s.. r. 50*l.* 6s., 430*l.*; 33, Alma-st., u.t. 40½ yrs., g.r. 10*l.* 10s., r. 36*l.*, 330*l.*; 43 to 49 odd, Alma-st., u.t. 40 yrs., g.r. 21*l.*, r. 125*l.*, 1,360.

SEPTEMBER 7.—By *Reynolds & Eason*: 53, Glenarm-rd., Clapton, f., 400*l.*

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G. ton	8/0/0	0/0/0
Teak, E.I. ..load	10/0/0	16/0/0
Sequoia, U.S.ft.cu	2/3	2/6
Ash, Canada load	3/0/0	4/5/0
Birch, do.....	2/15/0	4/0/0
Elm, do.	3/15/0	5/0/0
Fir, Dantsic, &c.	1/5/0	3/0/0
Oak, do.	2/10/0	4/10/0
Canada	5/15/0	7/5/0
Pine, Canada red	2/10/0	3/0/0
Do. Yellow	3/0/0	5/5/0
Lath, Dantsic, fath	4/10/0	5/10/0
St. Petersburg..	5/0/0	6/10/0
Walnscot, Riga, &c., log	2/15/0	5/0/0
Odessa, crown....	2/15/0	5/0/0
Deals, Finland and 1st std 100	7/10/0	9/10/0
Do. 4th & 3rd ..	7/0/0	8/10/0
Do. Riga	7/10/0	9/0/0
St. Petersburg, 1st yellow	10/0/0	13/0/0
Do. 2nd yellow	8/10/0	10/0/0
Do. white.....	8/10/0	11/0/0
Swedish.....	7/10/0	16/0/0
White Sea.....	7/0/0	15/0/0
Canada, Pine 1st	22/10/0	27/0/0
Do. do. 2nd....	17/0/0	18/0/0
Do. do. 3rd, &c.	7/10/0	10/10/0
Do. Spruce, 1st	8 10/0	11/0/0
Do. do. 3rd & 2nd	6/10/0	7/10/0
New Brunswick	6/0/0	7/5/0
Battens, all kinds	3/0/0	15/0/0
Flooring boards, sq., 1 in. prep. 1st	0/9/6	0/14/6
Do. 2nd.....	0/7/0	0/11/6
Other qualities...	0/5/0	0/6 6
Cedar, Cuba .. ft.	/3½	/4½
Honduras, &c.	/3½	/4½
Mahogany, Cuba	/2½	/6
St. Domingo, cargo av.	/3	1/6
Mexican do. do.	/3	/4
Tobasco do. do.	/3½	/6
Honduras do. ..	/3½	/5½
Box, Turkey ton	4/0/0	13/0/0
Rose, Rio.....	7/0/0	18/0/0
Bahia	6/0/0	17/0/0
Satin, St. Domingo.....	0/0/5	0/1/0

TIMBER (*continued*).		
Satin, Porto Rico	0/0/6	0/1/6
Walnut, Italian ..	0/0/3½	0/0/7

METALS.		
Iron—Pig, in Scotland .....ton	2 3 9	0/0/0
Bar, Welsh, in London	5/12 6	5/15/0
Do. do. at works in Wales.....	5/2/6	5/5/0
Do. Staffordshire, in London.....	6/0/0	6/10/0
COPPER — British cake and ingot	42/10/0	43/0/0
Best selected ..	43/0/0	43/10/0
Sheets, strong ..	51/0/0	0/0/0
Chili, bars	40/2/6	40/7/6
YELLOWMETALlb	0/0/4½	0/0/4½
LEAD — Pig, Spanish.....ton	9 18/9	0/0/0
English com. brands.....	10/0/0	10/1/3
Sheet, English, per sq. ft. and upwards.....	11/5/0	0/0/0
Pipe	12/15/0	0/0/0
ZINC — English sheet.....ton	19/0/0	19/0/0
Vieille Montagne	19/10/0	0/0/0
TIN—Straits.....	71/5/0	71/15/0
Australian.....	71/15/0	72/5/0
English Ingots..	74/10/0	75/0/0
Banca	73/0/0	73/5/0
Billiton	73/10/0	74/0/0

OILS.		
Linseed .....ton	20/2/6	20/10/0
Cocoanut, Cochin	29/10/0	0/0/0
Do. Ceylon	25/0/0	0/0/0
Palm, Lagos.....	25/10/0	26/0/0
Rapeseed, English pale	21/15/0	0/0/0
Do. brown.....	23/5/0	0/0/0
Cottonseed ref.....	20/5/0	21/5/0
Oleine	22/0/0	24/0/0
Lubricating, U.S.	4/0/0	5/0/0
Do. refined	5/0/0	12/0/0
TAR — Stockholm barrel	0/22/0	0/0/0
Archangel.....	0/11/0	0/0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than 10 a.m. on Thursday.*]

ABERGAVENNY.—For the erection of schoolroom, &c., at the Congregational Church, Castle-street:—

Jestyn Evans.....	£722 11	John Griffiths.....	532 0
J. S. Foster	548 0	J. N. Thomas, Abergavenny*.....	£519 10
Elijah Davis	532 0		

* Accepted

ARTHINGWORTH.—For repairs, &c.. to Arthingworth Hall, Leicestershire. Mr. J. T. Lawrence, architect, Leighton Buzzard:—

Watkin, Bros.	£195 10	H. Martin	£190 0
R. Cleaver.....	192 10	Smith, Bros.	184 15
T. H. Coleman.....	192 0		

BASFORD (Notts.).—For the erection of two cottages at Sewerage Outfall Works, Greasley, for the Rural Sanitary Authority. Mr. Herbert Walker, C.E., Newcastle Chambers, Nottingham:—

T. Smart	£609 0 0	W. E. Shaw	£487 0 0
H. Vickers	548 0 0	F. J. Stubbs.....	463 14 0
G. Allcock & Sons, Eastwood (accepted)	489 0 0		

BOURNEMOUTH.—For new golf pavilion at Meyrick Park. Mr. F. W. Lacey, A.M.Inst.C.E., Borough Engineer and Surveyor:—

F. Hoare & Son.....	£1,039	J. White.....	£950
George Shears & Son	995	J. McWilliams & Son*	897
W J. Chinchen	950		

*Accepted.

[Three informal tenders were also received.]

CARDIFF.—For building new Post Office at Cowbridge. Messrs. Bruton & Williams, architects and surveyors, Cardiff:—

Knox & Well	£971	Henry Davies	£752
David Davies	849	Haines	770
D. C. Jones & Co.....	831	J. Morgan.....	680
A. J. Howells.....	799	Cooksley, Pontyclown*	635

* Accepted.

CHICHESTER.—Accepted for sinking well at Grayling Wells Farm, for proposed asylum for West Sussex County Council, under Mr. W. Shelford, M.inst.C.E., of Westminster:—
Duke & Ockenden, Littlehampton £524

CHRISTCHURCH (Bournemouth).—For erecting new men's quarters and cottage homes at the workhouse, for the Christchurch Guardians. Mr. E. Burton, architect, Bournemouth:—

A. King	£12,974	Jones.....	£11,370
F. Hoare.....	12,674	Jenkins & Sons	10,847
George & Harding	12,524	W. J. Chinchen, East Cliff Works, Bournemouth*	10,500
Lucas	12,027		
M'William	11,992	J. White (withdrawn)....	8,750

* Accepted.

CROFTON PARK (Kent).—Accepted for the erection of a detached villa-residence for Mr. G. Hayward. Mr. John Jas. Downes, architect, 11, The Parade, Lewisham High-road, S.E.:—
Jackson, Lewisham..... £450

DEWSBURY.—Accepted for additions, &c., to Working Men's Club buildings. Messrs. Holtom & Fox, architects, Westgate, Dewsbury. Quantities by the architects:—

Masonry.

Wm. Scott & Sons, Leeds-road, Dewsbury	£397

Joinery.

J. Richardson & Sons, Staincliffe, near Dewsbury	144

Plumbing.

F. Newsome, Northgate, Dewsbury	64

Slating.

Geo. Fawcett, Eastboro', Dewsbury	20

Plastering.

James Lockwood, Staincliffe, near Dewsbury	32

DOVERCOURT.—For building a new Primitive Methodist Chapel, Dovercourt:—

Evans	£1,740 10 0	Saunders	£1,421 16 8
Smith, Beaumont & Dawson	1,579 0 0	J. Moran & Son, Dovercourt*.....	1,300 0 0
Gunn	1,549 0 0	Firmin	1,218 0 0
Brown.....	1,491 10 5		

* Accepted.

ECCLES (Lancs.).—Accepted for laying tar macadam and grit setts, with asphalte joints; also flagging, kerbing, &c., Stanley-avenue and other places for the Corporation. Mr. Arthur C. Turley, C.E., Borough Engineer, Town Hall, Eccles:—
Police Street Paving.—Balfe & Co., Flixton.....£317 15 7
Stanley Avenue.—Richard Lomax, 3, Irwell-terrace, Eccles 262 5 1
Cavendish Grove.—Wm. Armstrongf Walkden .. 412 7 4

ECCLES (Lancs.).—Accepted for the execution of sewerage works, Half Edge-lane and Canal-bank, for the Highway Committee. Mr. Arthur C. Turley, C.E., Town Hall, Eccles:—

Half Edge Lane Sewer.

Richard Lomax, Eccles £155 19 8
[Engineer's estimate, £151 4s. 0d.]

Canal Bank.

William Armstrong, Walkden.....£321 18 2
[Engineer's estimate, £318 8s. 0d.]

EGREMONT.—For erecting a pair of semi-detached villa-residences, Seabank-road, Egremont, Cheshire, for Mr. William W. Rae. Mr. L. Osborne Williams, architect:—

W. Thornton & Son.....£2,650		Hough & Pilling.....£2,285	
Raffle & Campbell	2,561	John McGeoch	2,250
Bleakley & Co.	2,395	Laurie & Brimley	2,229
T. Desoer.....	2,395	John Bellis.....	2,179

ELSTREE.—For the erection of a house. Mr. Arthur Keen, architect, 4, Raymond Buildings, Gray's Inn:—

Sabey & Son £1,175		C. Miskin £1,087	
J. & W. Savage	1,143	W. Bailey, Bushey Heath*	880

*Accepted.

EYRECOURT (co. Galway).—For rebuilding "Lisbeg House," for Mr. John Gairdner. Mr. J. Smith, C.E., Ballinasloe. Quantities by Messrs. Gribbon & Butler, Harcourt-street, Dublin:—

J. Pemberton & Son.....£5,500		Wm. Conolly & Son £4,500	
H. & J. Martin, Ltd.	5,357	John Broderick	4,480
S. H. Bolton & Sons	4,890	Denis M'Lynn	4,450
James Donovan	4,700	Collin Brothers	4,300
John Sweeney & Son	4,585	M. J. Martin, Portumna*..	4,035

* Accepted.

FARNHAM.—For new infant school, Hale, Farnham. Mr. J. A. Eggar, architect, Farnham:—

J. Glass £3,234 0		G. Kemp £2,378 0	
R. Pink, exors. of	2,628 0	W. J. Snuggs	2,333 0
H. Patrick & Co.	2,575 0	Tompsett & Kingham	2,325 0
A. Chuter	2,495 0	T. Martin	2,300 0
D. H. Porter	2,440 0	Gammon & Son	2,284 0
E. C. Hughes.....	2,423 10	McCarthy E. Fitt, Reading*.....	2,277 0
A. J. Figg	2,415 0		
Goddard & Son	2,402 0	Belham & Co.	2,271 0
Martin, Wells. & Co...	2,400 0	W. J. Chinchen.....	2,250 0
J. Bottrill & Son	2,395 0		

* Accepted (subject to the approval of the Education Department). Mr. Fitt's tender for the infant school was also accepted, his price being only £27 above the lowest tender.

FLEETWOOD (Lancs.).—For the construction of jetty and landing-place, Knot End, for the Improvement Commissioners. Mr. M. S. Gaulter, surveyor, Town Hall, Fleetwood:—

William Philp £2,595 19 2		Thomas Berry & Son£2,100 0 0	
Thomas Riley.....	2,460 0 5	W. Gradwell & Co., Barrow-in-Furness*	2,050 0 0
J. Kirkbride.....	2,300 0 0		

* Accepted provisionally.

[Surveyor's Estimate £1,987 4 4.]

FORDINGBRIDGE (Hants).—For the erection of school buildings, class-room, &c., at the National Schools:—

W. Horsey £597		T. Clarke £460	
J. Shering	503		

GRANTHAM.—For the supply and erection of a galvanised iron hospital for the Sanitary Committee. Mr. J. Evans, Borough Surveyor, the Guildhall, Grantham:—

J. Dixon & Co. £996 0 0		Glover & Son	822 0 0
Wrinch & Son.....	990 0 0	Skidmore & Co.....	782 15 4
Bruce & Still	842 3 9	Lawrence & Nichol ..	698 17 7
Humphreys, Ltd.	851 9 10	Martin & Fitt	682 10 0
Morton & Co.....	828 2 19	W. Harbrow, London*	620 14 7
J. Hawkins	805 0 0		

* Accepted.

GREAT STANMORE.—For the erection of two shops with residences, bakehouse, and stabling, at Great Stanmore, Middlesex, for Mr. Walter Taylor. Mr. R. Owen Allsop, architect:—

C. Miskin £2,675		Geo. Kirby & Sons, Great Stanmore* £2,584	
McCormick & Sons	2,648		
Clifford & Gough	2,635		

* Accepted.

HAYWARD'S HEATH (Sussex).—For constructing 2,500 yards pipe sewage, for the Local Board. Mr. Wm. Beach, Surveyor, Perrymount-road, Hayward's Heath:—

Fore & Son £1,940 0 0		W. Steer.....£1,489 0 0	
Lea & Sons	1,863 12 0	W. H. Wheeler	1,470 0 0
J. Jackson.....	1,859 0 0	W. Meals, East-bourne (accepted)	1,390 0 0
S. Kavanagh	1,843 9 11		
Box & Turner.....	1,771 0 0	J. R. Hunt.....	1,302
Ostenton	1,670 0 0		

HEREFORD.—For alterations and additions to "Elmhurst," Aylestone Hill. Mr. W. W. Robinson, architect, 10, King-street, Hereford:—

Bowers & Co.....£639		S. Lewis (accepted).....£467	
J. Lloyd	520	[All of Hereford.]	

HAYWARD'S HEATH.—For forming roads and sewers (1,600 yards), for the Local Board. Mr. W. Breach, Surveyor, Hayward's Heath:—

J. Jackson..... ...£3,972	0 0	Fry Brothers.....£3,089	0 0
Box & Turner..... 3,862	0 0	W. H. Wheeler	3,078 0 0
J. Mayo..... 3,497	5 10	W. Meals, East-bourne*.....	2,899 0 0
W. Coker 3,386	0 0		
J. R. Hunt 3,307	0 0	S. Kavanagh	2,450 0 0
W. Steer 3,287	0 0	D. H. Porter.....	2,378 0 0
Fore & Sons 3,237	0 0		

* Accepted.

HEREFORD.—For alterations and additions to the Catholic Schools. Mr. W. W. Robinson, architect, 10, King-street, Hereford:—

Bowers & Co.....£394		R. Taylor (accepted).....£338	

[Both of Hereford.]

LAUNCESTON.—For the supply of 796 tons of cast-iron pipes, for waterworks, for the Town Council. Messrs. Jenkin & Son, engineers, Liskeard, Cornwall:—

McFarlane, Strang, & Co. £3,679	5 0	Jas. Oakes & Co. ..£3,479	17 5
Staveley Coal and Iron Co.	3,606 0 9	Stanton Ironworks Co.	3,442 19 5
Clay Cross Co.	3,591 11 8	Spittel, Limited....	3,387 3 8
R. Laidlaw & Sons	3,535 13 2	J. & S. Roberts....	3,387 3 8
Charles Jordan & Sons.....	3,513 13 11	Shaw & McInnes, Firhill Ironworks, Glasgow*	3,294 17 0
Cochrane & Co.....	3,479 17 5		

* Accepted.

The total weight of the pipes required is 796 tons 15 cwt. 3 qrs. 20 lb., in 8 in., 7 in., 6 in., 5 in., and 3 in. The total weight of the 6 in. pipes is 732 tons 3 cwt. 3 qrs. 4 lb. To facilitate comparison, the total cost delivered free at Launceston of only the 6-in pipes is here given.

LEDBURY (Herefordshire).—Accepted for altering and addin to the Boys' and Girls' and Infants' Schools, for the School Board. Mr. G. H. Godsell, F.S.I., architect, Hereford:—
David Smith, Ledbury £950 10

LINSLADE (Bucks).—Accepted for the erection of buildings for the electric light supply to "The Gables," Linslade. The work to be measured up and valued by the architect on completion. Mr. J. T. Lawrence, architect, Leighton Buzzard, Beds.:—
Messrs. Edwards & Yirrell (for building).
Messrs. Maw & Co. (for internal tile fittings).
[Architect's approximate estimate, £300]

LIVERPOOL.—For the erection of store-rooms, &c., Woodstock-street, Liverpool, for Mr. Jos. Chipchase. Mr. L. Osborne Williams, architect, 70, Victoria-street, Liverpool:

R. H. Meredith £155		Thomas Hughes, 30, St. Andrew's-road, Everton, Liverpool (accepted) £127	
P. Tyson	148		
Hough & Pilling	145		

LONDON.—For the construction of a pipe-sewer, Albany-street, and round part of Regent's Park, &c., for the St. Pancras Vestry. Mr. W. N. Blair, C.E., Engineer, Vestry Hall, Pancras-road, London, N.W.:—

Zoological Gardens Sewer.

	Total amount of tender in open cutting.		Amount of tender in shafts and headings.
Wilkinson, Bros.	£2,332 0 0	....	£2,282 0 0
William Walker	2,527 1 4	....	2,377 1 4
George Bell	2,841 10 0	....	2,093 10 0
R. Ballard, Limited	2,328 11 8	....	2,177 0 0
F. A. Jackson & Son	2,572 0 0	....	2,247 0 0
Joseph Mears	2,290 0 0	....	2,185 0 0
Thomas Adams	2,673 11 5	....	2,623 11 5
S. W. Pattinson	2,850 0 0	....	2,750 0 0
Henry Crane.....	2,455 0 0	....	2,355 0 0
John Jackson.....	2,520 10 4	....	2,390 10 4
C. W. Killingback & Co., James-street, N.W....	2,332 0 0	....	2,182 0 0*
H. Wall & Co.	2,603 10 0	....	2,543 10 0
James Dickson.....	2,478 0 0	....	2,378 0 0

* Accepted.

Brunswick Square.

James Dickson £804	0 0	R. Ballard, Ltd.....£617	0 0
Wilkinson, Bros.....	785 0 4	William Walker	614 13 0
Thomas Adams	731 0 0	C. W. Killingback & Co.	613 0 0
H. Wall & Co.	717 0 0	John Jackson, The Laurels, Plaistow, E. (accepted)	584 12 9
F. A. Jackson & Son	690 0 6		
S. W. Pattinson.....	675 0 0		
Henry Crane	649 0 0		
Joseph Mears.....	622 0 0		

LONDON.—For painting, distempering, &c., at the Casual Wards, for the Guardians of Mile End Old Town. Mr. C. F. Burden, Surveyor:—

Eaton & Co. £226	0 0	A. Derby	£115 0 0
Robey	205 0 0	Barker	110 0 0
Howell	162 0 0	Crow (accepted).....	109 0 0
F. J. Wood	148 0 0	Mills	106 0 0
C. Coles	140 0 0	Barker & Oliver.....	98 0 0
Vigor & Co.	139 0 0	Judd & Son	97 0 0
C. Coot	137 0 9	Stewart & Co.	91 12 9
Wall & Co.	125 0 0	J. White	85 0 0
Wales.....	121 7 0		

[Surveyor's estimate, £120.]

LONDON.—For the erection of a new hall in Devon's-road, for the Blackthorne Building Committee. Mr. G. E. Holman, architect, 109, Bow-road, E. Quantities by Mr. A. J. Turner, 9, Sergeants Inn, Fleet-street, E.C.:—

Ashby & Horner £4,427		Higgs & Hill £3,944	
Woodward & Co.	4,400	W. Shurmur.....	3,936
F. & F. J. Wood	4,343	Slow & Hunter	3,875
Killby & Gayford	4,109	W. Wells	3,885
G. J. Hosking	3,993	P. H. Craig	3,774
J. Coxhead	3,986	T. White & Son.....	3,730
Holliday & Greenwood ..	3,977		

[Surveyor's estimate, £3,750.]

LONDON.—For the execution of certain works required in building a fence wall, erecting a disinfecting station, &c., at the Board of Works Depot, Glaucus-street, for the Poplar District Board of Works. Quantities not supplied:—

F. W. Hubbard £1,053	17 6	J. H. Jackson £857	0 0
J. T. Robey 1,025	0 0	J. Edmund	824 0 0
(Unsigned tender) .. 995	0 0	T. White & Son.....	802 0 0
J. Yates & Co..... 875	0 0		

[Surveyor's estimate, £932.]

LONDON.—For new steam cooking plant at the workhouse, for the Guardians of Mile End Old Town. Mr. C. F. Burden, Surveyor:—

Clements, Jeakes, & Co. £508	0	J. & W. Coles £296	10
T. Waller & Co.	439 0	Moorwood & Co.....	295 0
W. Sugg & Co.....	385 0	Joseph Richmond & Co.	258 0
J. F. Clark & Sons	300 0	J. W. Brooke (accepted)	243 0

[Surveyor's estimate, £250.]

LONDON.—For repairs, painting- decorations, &c., at No. 74, St. George's-road, South Belgravia. Messrs. Rogers, Chapman & Thomas, architects:—

Hook £377	18	Stimpson & Co.....£333	0
Styles	361 0	Laing	293 10

LONDON.—For proposed alterations and repairs to the "Devonshire Castle" publichouse, 320, Harrow-road, W., for Mr. N. G. Wakley. Messrs. Bird & Walters, architects:—

Stimpson & Co. £1,580		H. Burman & Son £1,480	
Patman & Fotheringham..	1,577	W. Marks	1,369
Gould & Brand	1,547	Dearing & Son	1,367
E. Toms	1,493		

LONDON.—For pulling down and rebuilding party wall and portion of front wall at 119 King's-road, Camden Town, N., for Mrs. Deyes. Mr. R. Owen Allsop, architect:—
N. Lidstone, 96, Blackstock-road, N. £254

LONDON.—For reinstating portion of the premises destroyed by fire at the Victoria Steamboat Association's dockyard, Battersea Bridge-road, S.W. Messrs. Fuller, Horsey, Sons, & Cassell, surveyors, 11, Billiter-square, E.C.:—

Baker Bros.	£320	F. H. Rake*	£298
W. E. Hill	305	* Accepted.	

LONDON.—For alterations, additions, and general repairs to Nos. 503-5-7, for Mr. R. A. Langford. Mr. John Jas. Downes, architect, 11, The Parade, Lewisham High-road, S.E.:—

Herring	£975	Messrs. Powditch	£830
Messrs. Larke	806	Champion	705
Messrs. Lorden	867	Best, New Cross*	689
*Accepted.			

LONDON.—Accepted for enlargement of warehouse, Stoke Newington, for J. Hibbard & Sons, Limited. Mr. Edmund Matthews, architect:—
Chas. Morley Hazell, 8, Green-lanes, N. £760

LUSTON (Herefordshire).—Accepted for additions, &c., to "Eye Cottage." Mr. W. W. Robinson, architect, 10, King-street, Hereford:—
Page & Son, Leominster £1,289

MITCHAM.—For the erection of a cottage residence at Baron Grove, Mitcham, for Mr. H. S. Coldicott. Mr. Robt. M. Chart, architect and surveyor, Croydon and Mitcham:—

J. Quittenton	£1,231	E. Goulder	£1,158
Rice & Sons	1,115	E. J. Burnand	1,148
C. Stewart	1,170	J. Burges	1,085

MITCHAM.—For the erection of a pair of cottages at Eastfields, Mitcham, for Messrs Mizen Bros. Mr. Robt. M. Chart, surveyor, Croydon and Mitcham:—

C. Stewart	£595	J. Burges	£420
E. J. Burnand	435	M. A. Lawrence	409

NEWCASTLE-ON-TYNE.—For rebuilding the "Great Eastern" Hotel, Milk Market, Newcastle-on-Tyne, for Messrs. W. & J. Raeburn, Edinburgh. Mr. Edwin Bowman, architect, 62, Grainger-street, Newcastle-on-Tyne. Quantities by the architect:—

J. & W. Lowry	£2,148 14 4	I. C. Hope	£1,500 0 0
Middlemiss Bros.	1,893 0 0	E. & T. George	1,436 15 7
Kirk & Brown	1,577 15 10	Jas. Lunn, Newcastle*	1,429 4 11
T. Weatheritt	1,543 0 5		
F. Wakefield	1,512 0 0		

* Accepted after deductions at £1,151.

NEWPORT (Mon.).—For the erection of the "Steam Packet" Hotel, New Dock-street, Newport, Mon., for Messrs. W. Hancock & Co., Limited, Cardiff and Newport. Mr. W. L. Griffiths, architect, 27, High-street, Newport. Quantities by architect:—

Stephens, Bastow, & Co.	£2,579	J. T. Morris	£2,225
Wm. Price	2,550	E. C. Jordan	2,195
D. C. Jones & Co.	2,395	J. Davies	2,100
C. H. Reed	2,300	J. Linton	2,085
Dyson Parfitt	2,269	W. A. Linton, Newport*	2,048
J. Jenkins	2,263	A. S. Morgan	2,025
J. Moore	2,255	* Accepted.	

NORTHAMPTON.—For the erection of stabling, loose boxes, and cart shelters in Mill-street, Semilong, for Mr. Robert Wiggins. Messrs. Mosley & Anderson, architects, Goodyear Chambers, Northampton. Quantities by architects:—

J. W. Walls	£625 0	Wilford & Judkin	£540 0
R. Hickman	620 0	G. F. Sharman	539 0
J. Garrett	579 10	W. Throssell	535 0
J. Robinson	562 0	J. Dunckley	523 0
Newman Adams	545 0	T. A. Fisher	515 0
W. Gregory & Son	544 10	A. J. Chown (accepted)	464 10
[All of Northampton.]			

PENMAENMAWR (N. Wales).—For the erection of a pair of semi-detached houses. Mr. L. Osborne Williams, architect, 70, Victoria-street, Liverpool. Quantities by the architect:—

Erasmus Jones	£1,437	W. H. Bleakly	£1,390

PENYCAE (Ruabon).—For the erection of a mission-room and infants' school for the Rev. L. D. Jenkins, Vicar of Penycae. Mr. J. E. Lash, architect, Wrexham:—

Thos. Brown	£730 0	J. T. Jones	£687 0
J. Davis	696 16	S. Moss	680 0
Jenkins & Jones	695 0	J. Whittingham	658 0
W. H. Thomas	694 9	E. Bradshaw, Wrexham*	655 10
* Accepted.			

PENYGILLI (Wrexham).—For the erection of an Infants' School, to accommodate 260 children, for the United School Board District of Bersham. Mr. J. E. Lash, architect, Wrexham. Quantities by the architect:—

Thomas Williams	£2,123 0	Samuel Moss	£1,700 0
Richard Griffiths	1,785 11	Davies & Whittingham	1,572 0
Harrison & Griffiths	1,780 0	Edward Bird, Coldporth (accepted)	1,532 0
James Hughes	1,736 19		

PINCHBECK (Lincolnshire).—For the erection of a Baptist Chapel at Pinchbeck. Mr. R. H. Holmes Hand, architect:—

J. Derby	£670	J. W. Perkins (accepted)	£559
J. Leafe	627		

ROMFORD.—For draining that part of the Parish of Hornchurch adjoining Romford, for the Union Rural Sanitary Authority. Messrs. Brundell, Simmons, & Brundell, engineers, 1, Princes-street, Doncaster:—

J. & J. Jones	£2,626 15 7	Geo. Osenton	£2,011 0 0
J. C. Thompson	2,534 18 0	W. Hook	1,942 11 6
J. Burrill	2,468 0 0	D. Brewer	1,836 0 0
Edmund Iles	2,366 0 0	Geo. Bell	1,813 0 0
J. Jackson	2,275 0 0	John Band	1,770 0 0
Wm. Wadey & Co.	2,233 0 0	Macandrews & Co.	1,750 0 0
H. Michell	2,177 0 0	J. L. Cattell	1,740 0 0
C. W. Killingback & Co.	2,172 11 2	G. G. Rayner, Orrell Park, Liverpool*	1,675 0 0
Wm. Coker	2,040 0 0	D. H. Porter	1,649 0 0
* Accepted.			

ST. ANNES-ON-SEA (Lancs.).—For the construction of East Bank-road for the Local Board. Mr. H. Helme, Surveyor. No quantities:—

Whitam Sutcliffe	£590 11 10	Matthew Hall	£545 5 0
Thos. Horrocks	585 7 6	E. Hindle	519 7 0
Robt. Greaves	568 10 0	Simon Johnson, Manchester (accepted)	484 11 9
Fred Harrop	560 0 0		

SOUTHEND.—For laying about 250 yards of 21-in. pipe-sewer, &c., Hamlet Valley, for the Corporation. Mr. C. T. Copley, Borough Surveyor, Clarence-road, Southend:—

J. & J. Jones	£446 10 4	E. Iles	£360 17 6
D. H. Porter	412 4 0	C. F. Coker	318 13 11
G. Wimpey & Co.	406 14 7	W. Buxton, Prittlewell, Southend*	315 3 2
F. Dupont	383 19 7	C. W. Killingback & Co.	314 17 9
John Band	373 0 0		
Henry Lee	366 13 5		
* Accepted.			

SPALDING.—For alterations to a house and shop in the Market-place, Spalding, for Mr. Elsom. Mr. R. H. Holmes Hand, architect:—

Jepson	£448 10	Perkins (accepted)	£370 10
Peake	395 0		

SUNDERLAND.—For new workshop for Messrs. W. B. Harrison, Sunderland. Mr. Frank Caws, architect:—

G. Swinhoe	£309 3 6	D. & J. Ranken*	£275 0 0
J. Huntley	284 0 0	* Accepted.	

UPPERHILL (near Leominster).—Accepted for altering and adding to Mixed School, for the School Managers. Mr. G. H. Godsell, F.S.I., architect, Hereford:—
J. J. Davis, Leominster £319

WOLVERHAMPTON.—For works at the Walsall-street Schools, for the Wolverhampton School Board. Mr. T. H. Fleeming, architect, Wolverhampton:—

Hot-water Low-pressure Apparatus.
Killick & Cochran, Liverpool (accepted) £460 0 0

Supplying and Fixing Electric Light Installation and Fittings.
Scott & Co., Birmingham (accepted) £233 10 0

YOUGHAL (Ireland).—For the construction of reservoir, filtration tanks, &c., for the Town Commissioners. Mr. S. A. Kirkby, M.A., County Surveyor, Cork:—

T. J. Dixon	£8,232 9 6	Michl. Walsh, Bansha Castle, Tipperary*	£5,945 8 3
Michl. Connors	7,583 5 6	E. W. Finn	5,697 9 4
Denis Forde	6,905 11 4	* Accepted.	
R. W. Johnson, C.E.	6,141 18 9		
Hickson & Peet	6,010 4 4		
James Donoghue	5,670 3 9		

[Each contractor made out his own quantities.]

TO CORRESPONDENTS.

We are compelled to decline pointing out books and giving addresses.

J. W. B.—T. S.—M. & F.—B. & H. (amounts should have been stated).—R. W. B. (the subject has already been drawn attention to in our columns).

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THE "BUILDER" CATHEDRAL SERIES
ENGLAND AND WALES.
(January, 1891, to June, 1893.)

In each case—EXTERIOR VIEW, specially drawn for this series, GROUND PLAN, to a large scale, shaded to indicate the date and style of the several parts; DESCRIPTIVE ARTICLE, with sketches of details, &c.

*1. Canterbury	9. Norwich	17. Llandaff	24. Truro
*2. Lichfield	10. Rochester	18. Oxford	25. St. David's
*3. St. Alban's	*11. Lincoln	19. Southwell	*26. York
*4. Peterboro'	12. Gloucester	20. Worcester	*27. Ripon
*5. Wells	13. St. Paul's	21. Bangor and	28. Chester
*6. Exeter	14. Hereford	22. St. Asaph	29. Manchester
*7. Salisbury	15. Chichester	*23. Winchester	30. Carlisle
8. Bristol	16. Ely		*31. Durham

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IRELAND.
(April to June, 1894.)

1. St. Patrick's | 2. Christchurch | 3. Kilkenny.

THE ABBEYS OF GREAT BRITAIN.
1894.

1. Westminster	*Jan.*	3. Glastonbury	*Aug.*	6. Bath	*Nov.*
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EUREKA GREEN SLATES.
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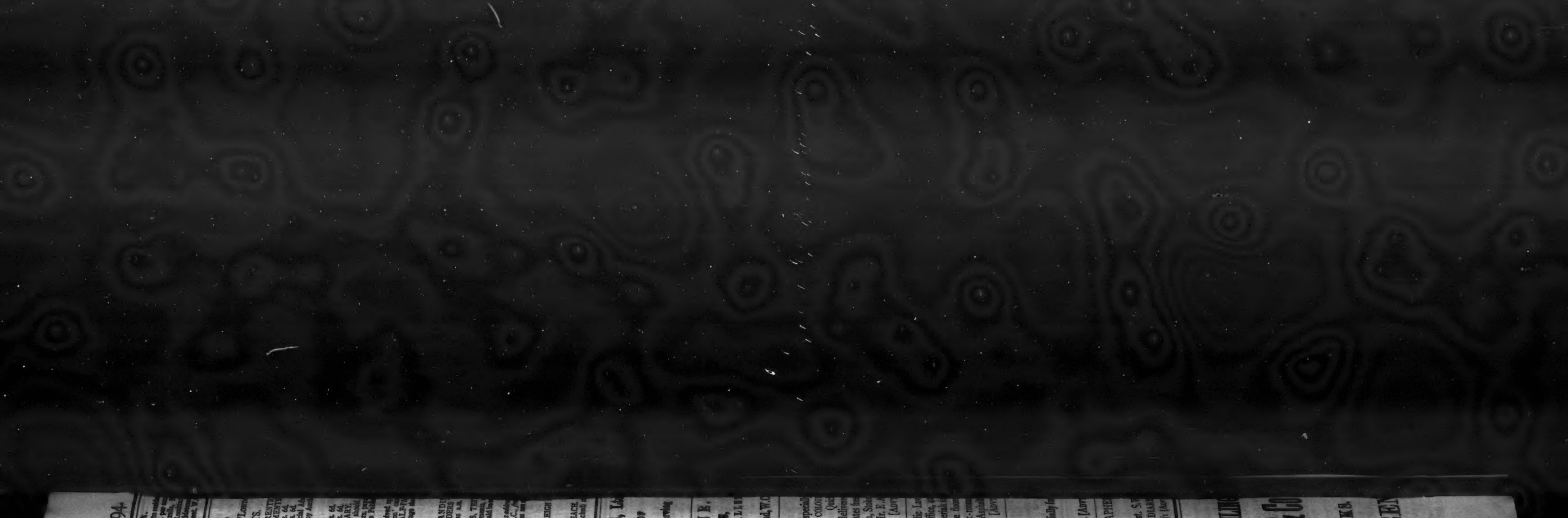
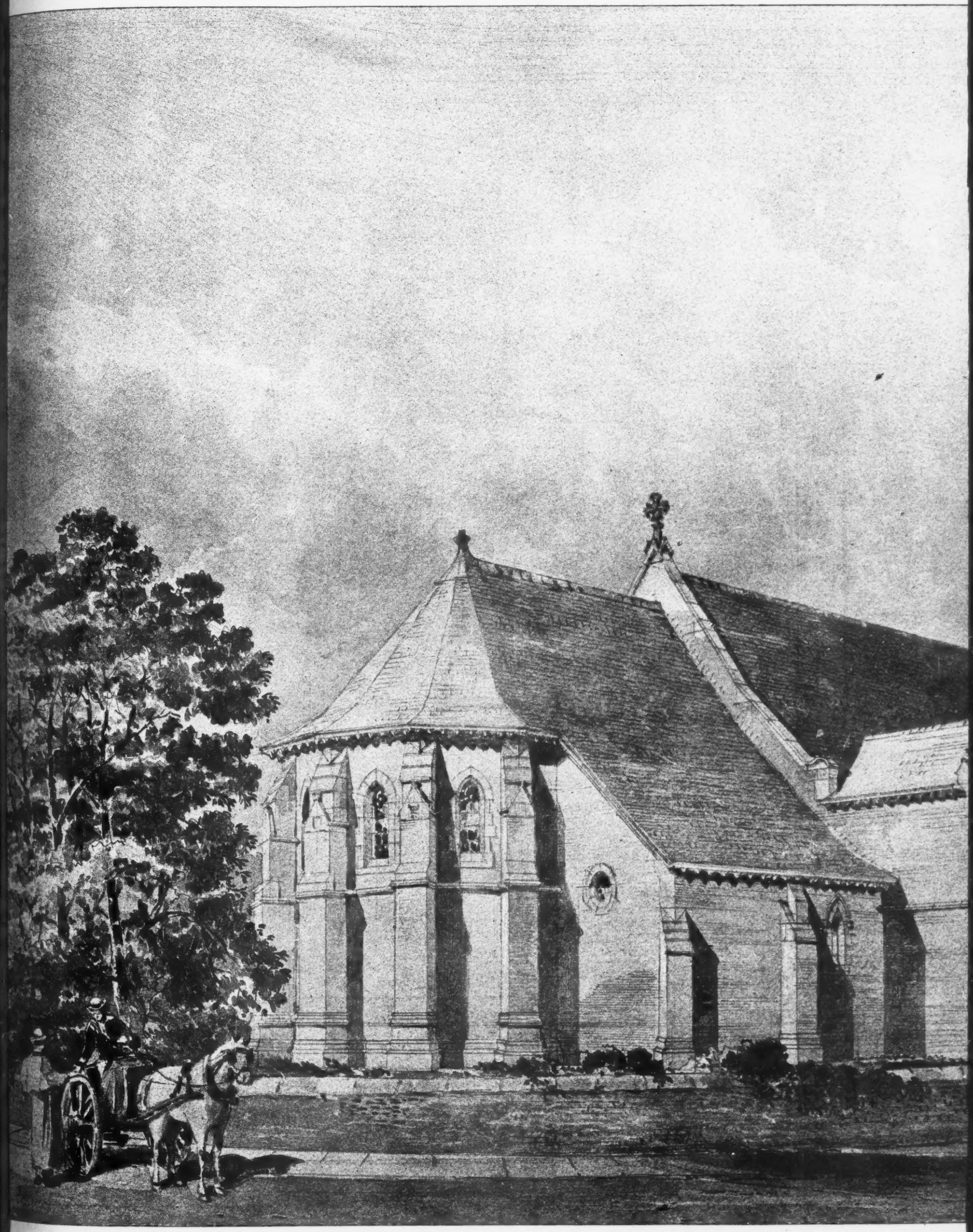
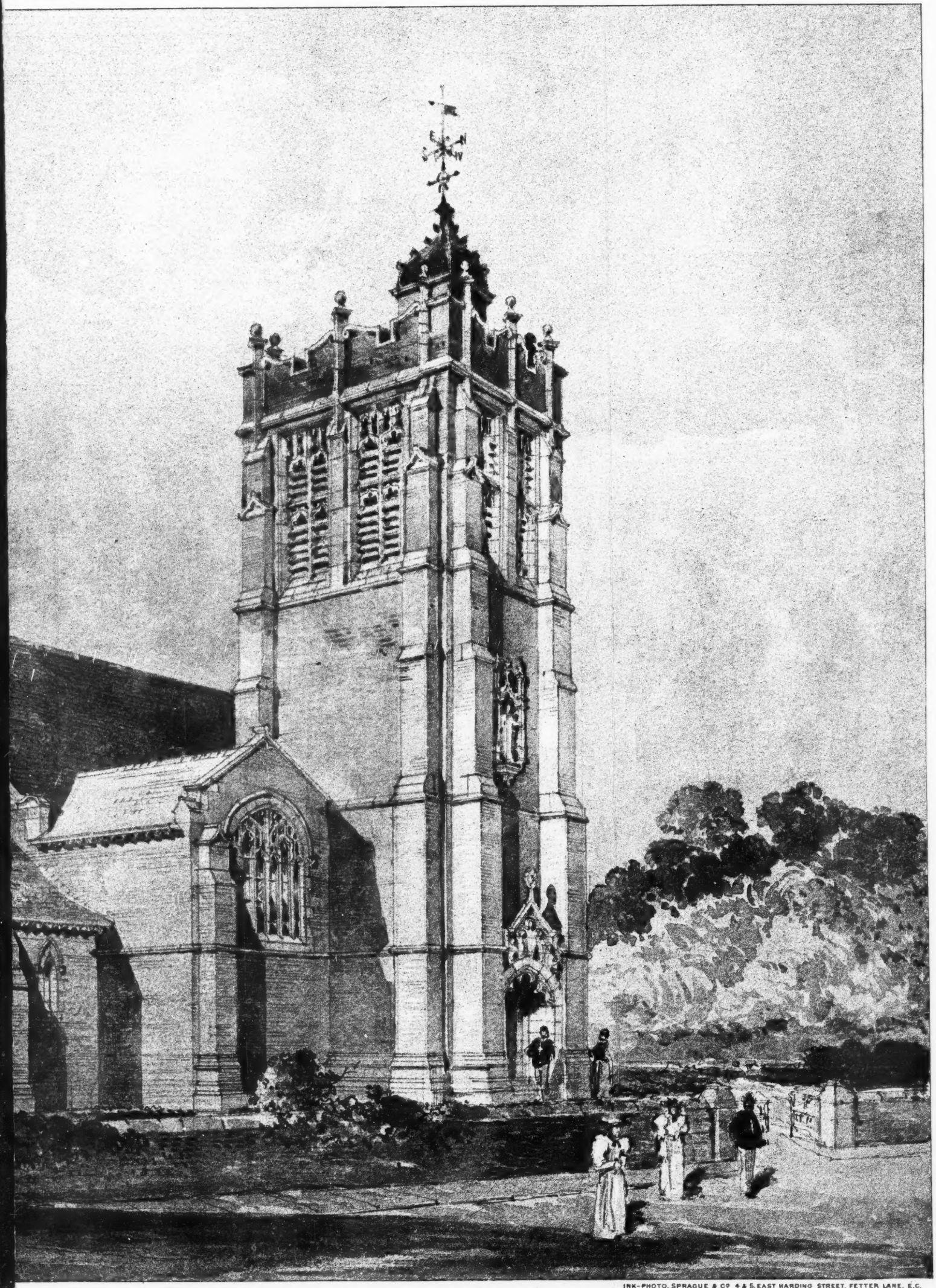




CHURCH OF ST. MARY, WANDSWORTH.—Mr. E. W. Mc

Academy Exhibition, 1894.



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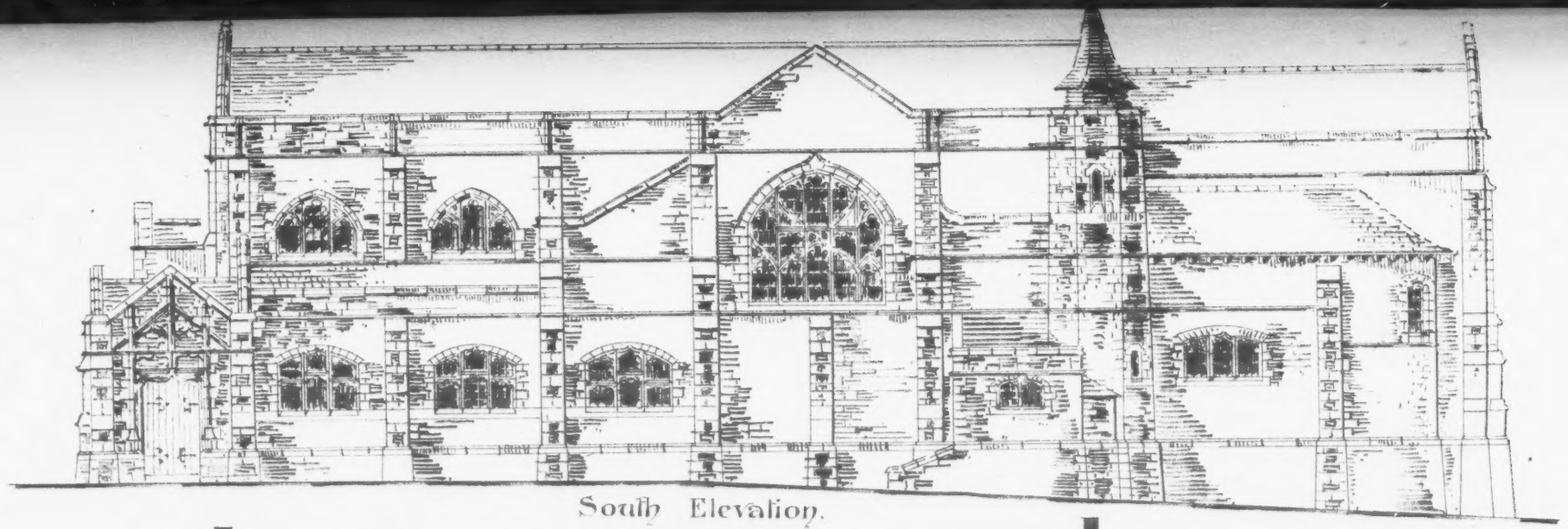
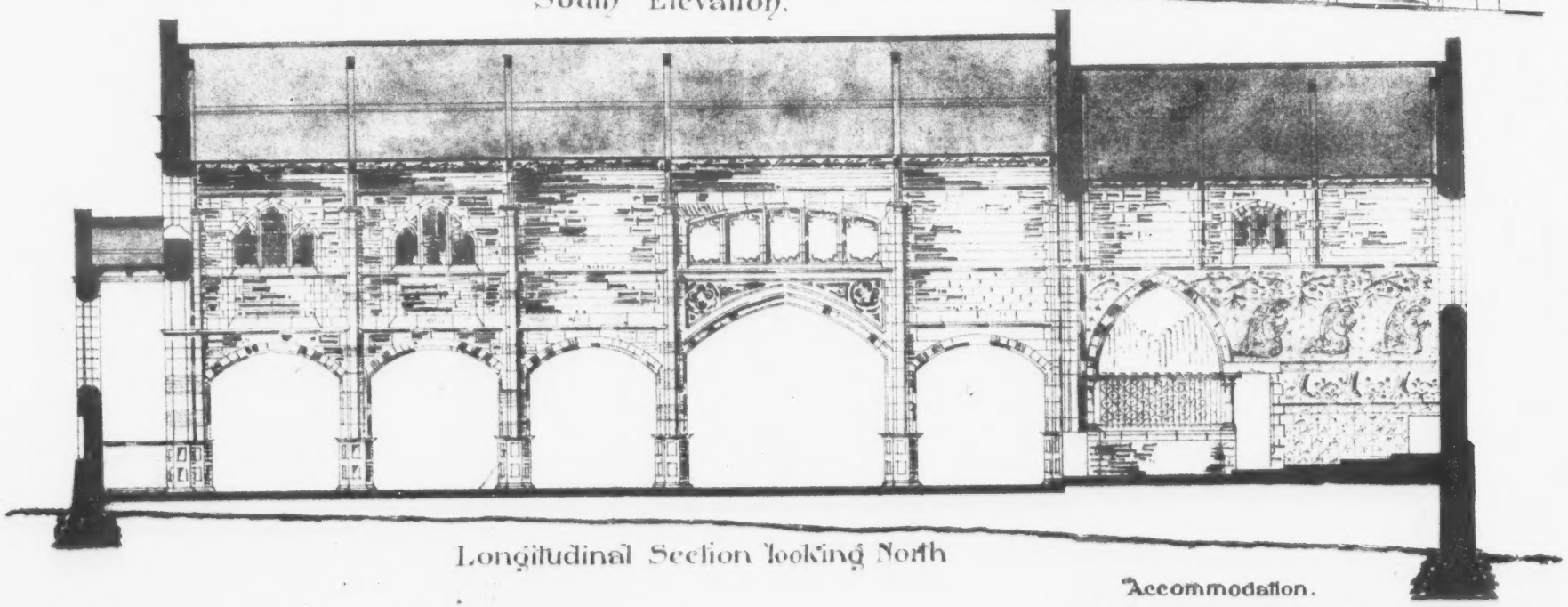
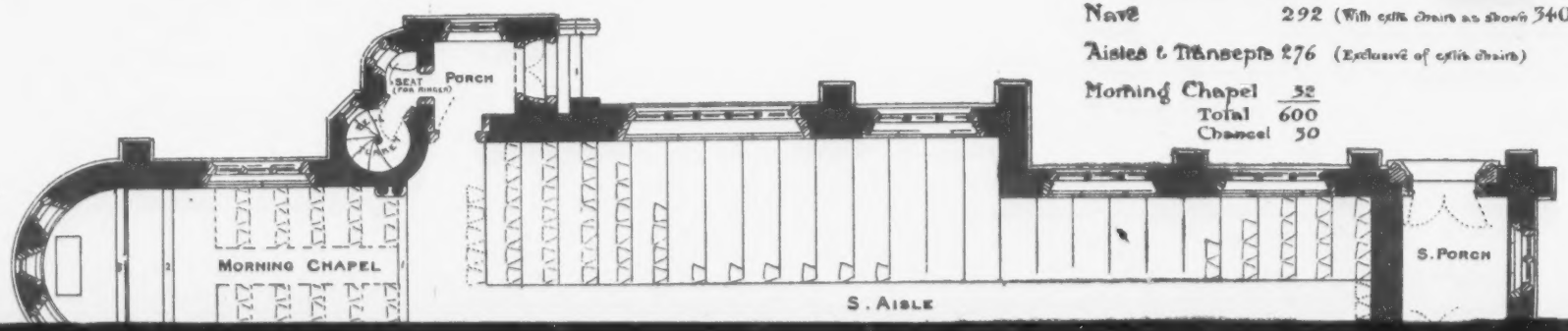
SWORTH.—Mr. E. W. Mountford, Architect.



South Elevation.

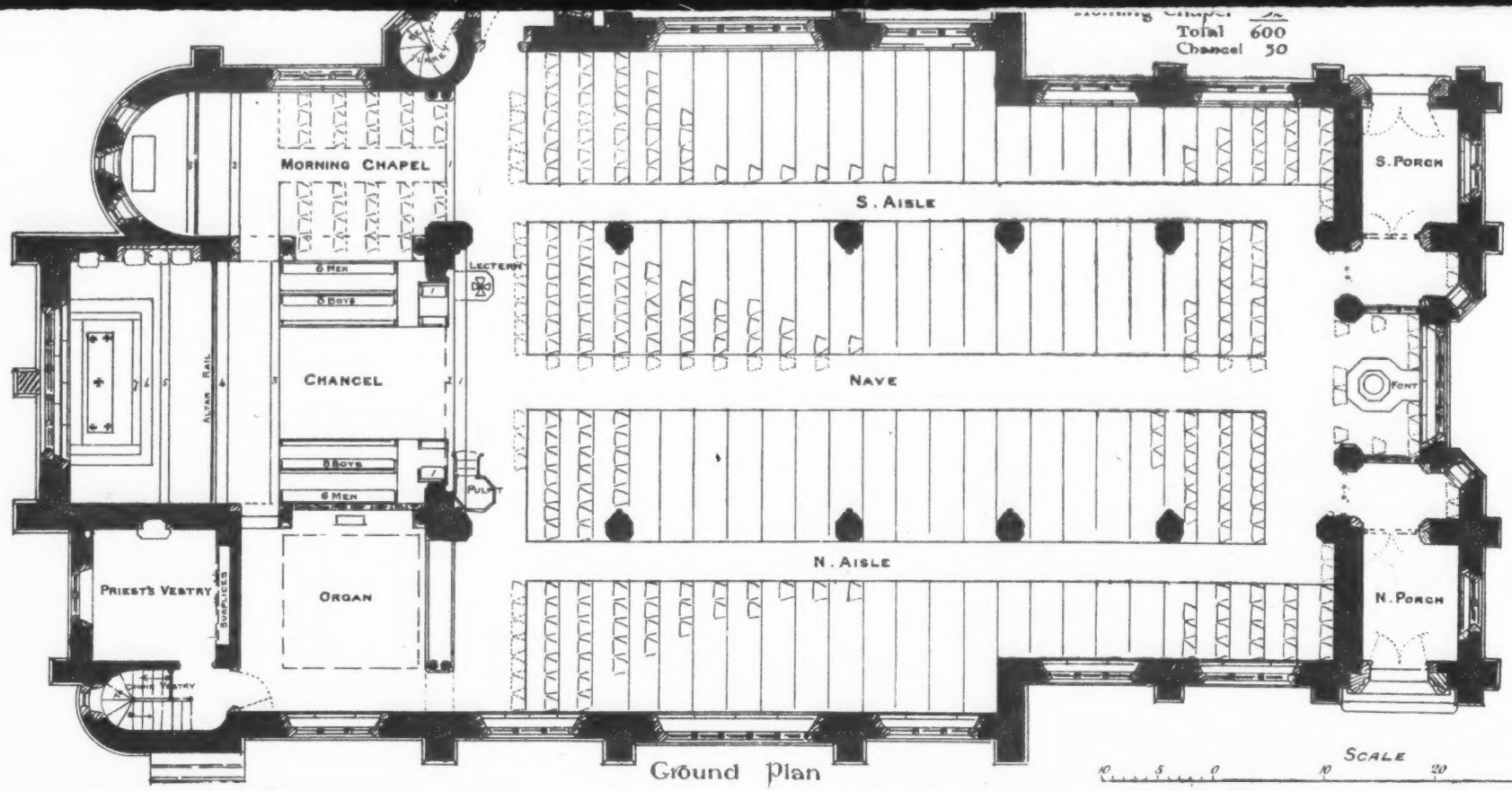


Longitudinal Section looking North

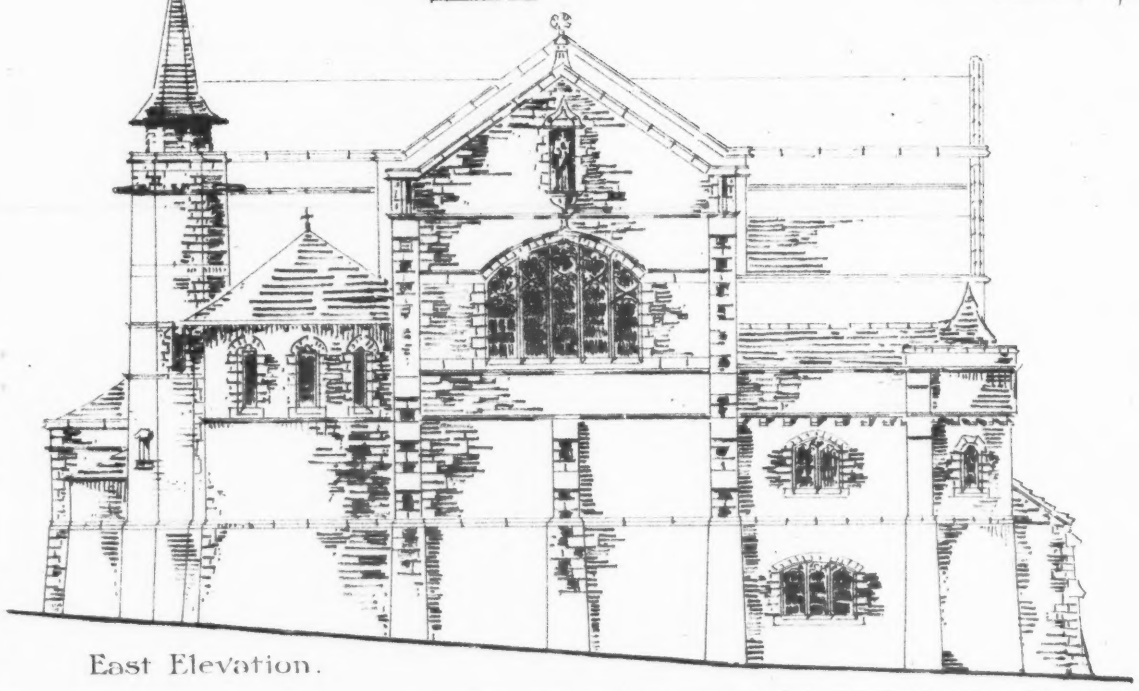


Accommodation.

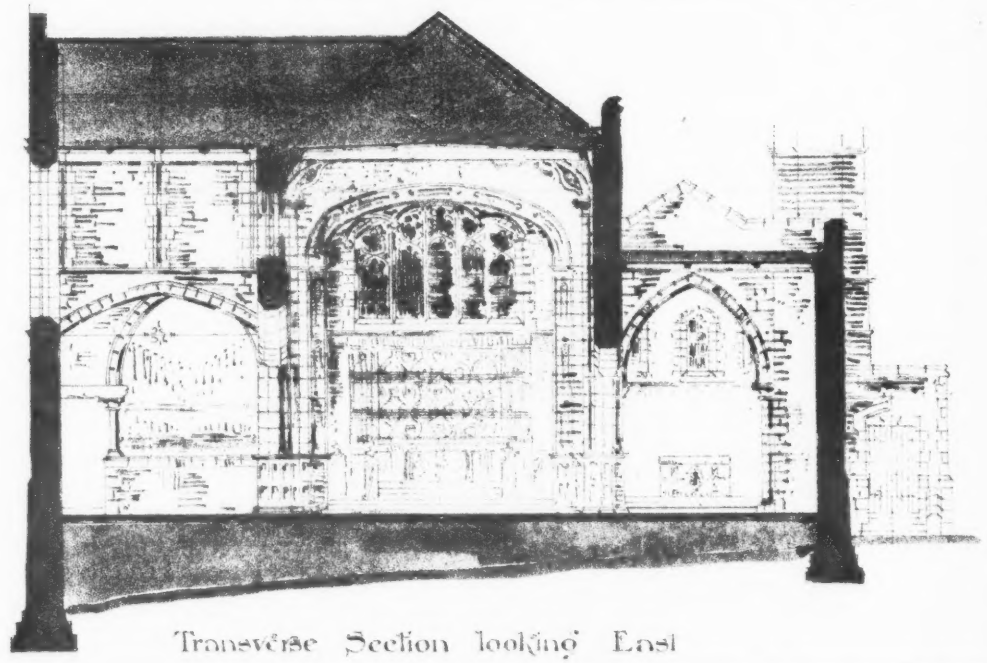
Nave	292	(With extra chairs as shown 340)
Aisles & Transepts	276	(Exclusive of extra chairs)
Morning Chapel	32	
Total	600	
Chancel	30	



Ground Plan



East Elevation.



Transverse Section looking East

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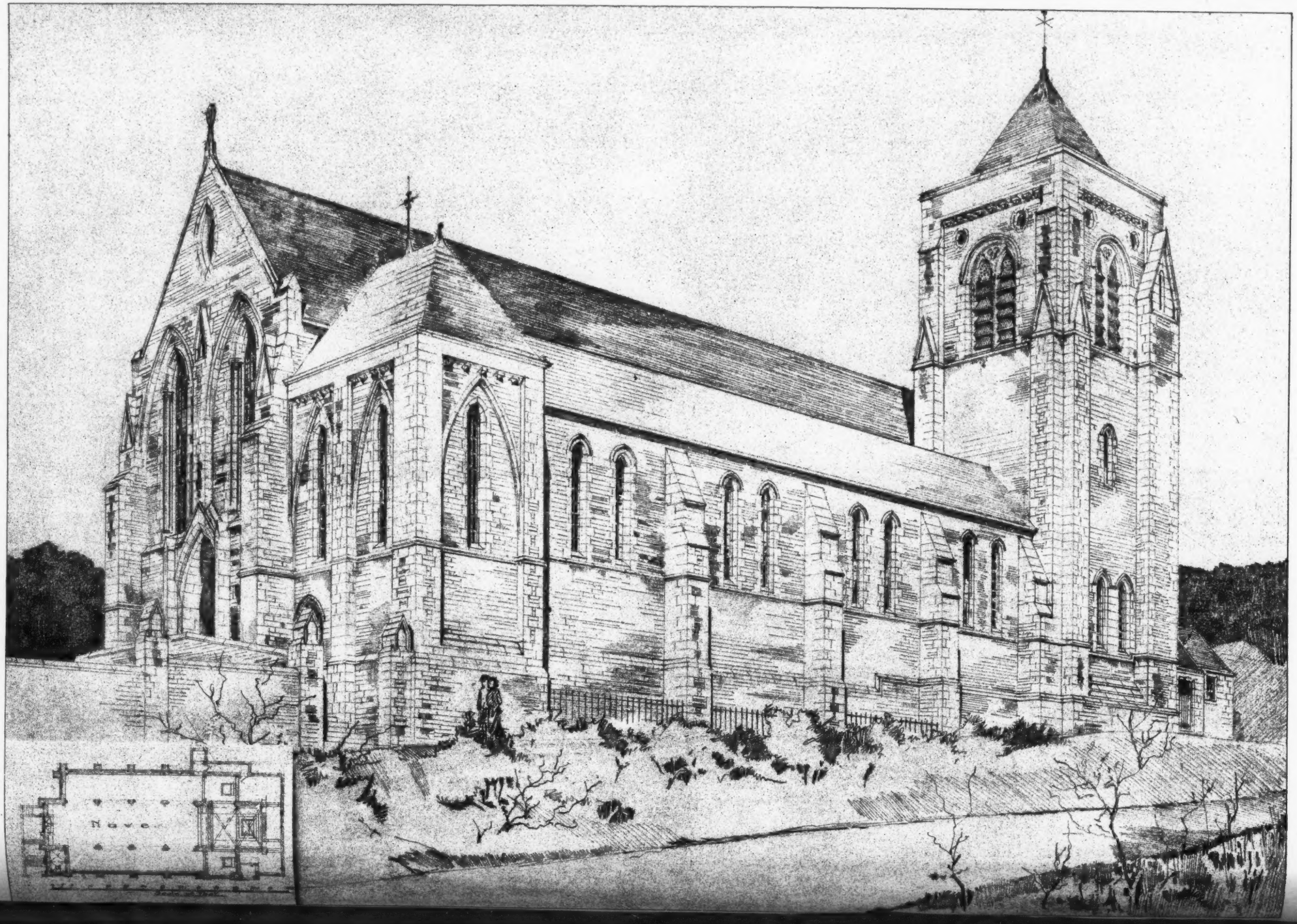
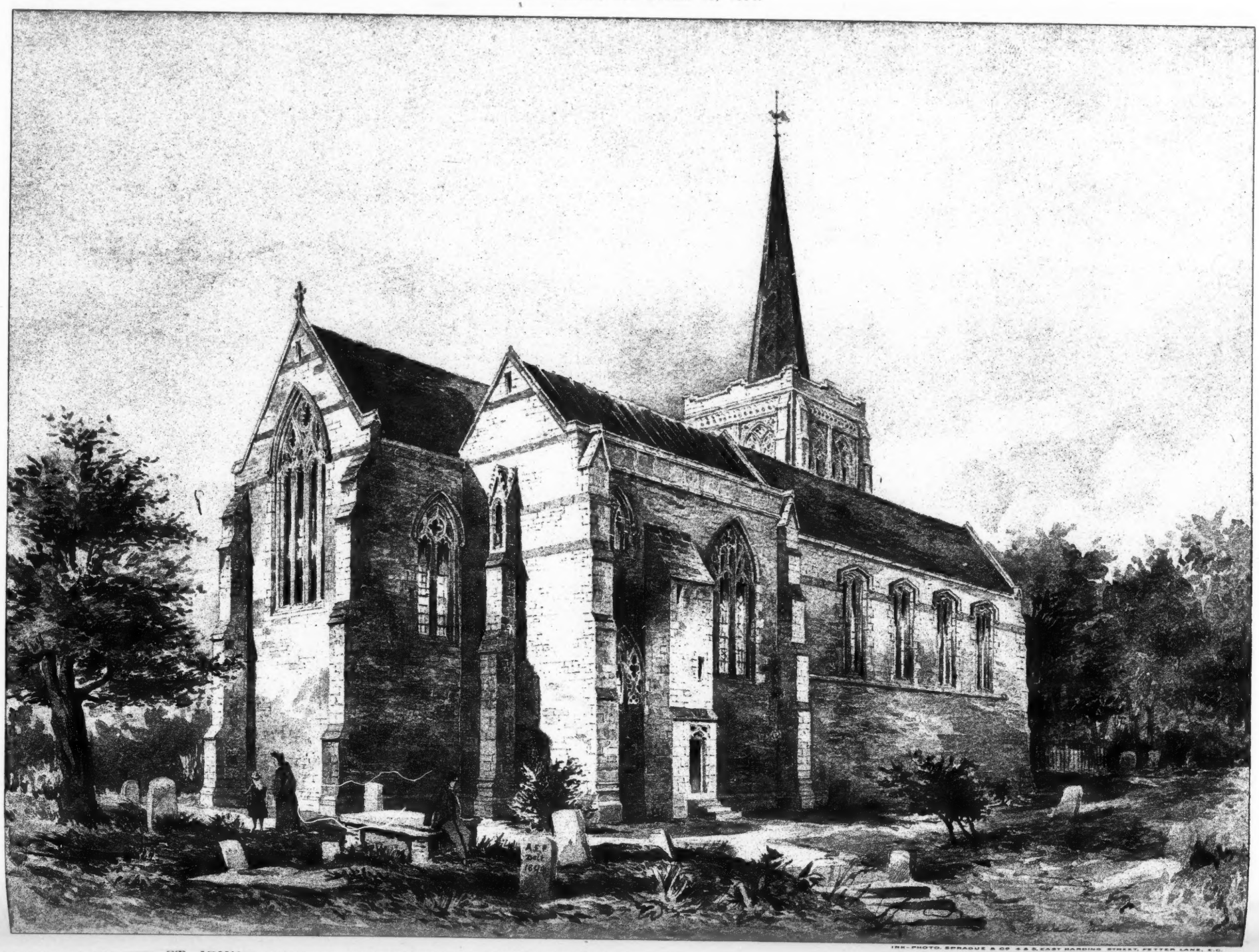
COMPETITION DESIGN FOR COCKINGTON CHURCH, DEVON.—By Messrs. Tait & Harvey.


Nave



Royal Academy Exhibition, 1894. ST. JOHN'S CHURCH, WHITTINGTON, SALOP: EXTERIOR VIEW FROM NORTH-EAST. Mr. J. H. Sedding, Architect.

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INK-PHOTO. SPRAGUE & Co 4 & 5, EAST HARDING STREET, FETTER LANE, E.C.

ST. JOHN'S CHURCH, WHITTINGTON, SALOP: INTERIOR VIEW.—Mr. F. B. Wade, Architect

Royal Academy Exhibition, 1894.

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A MOORLAND CHURCH, WITH SUNDAY SCHOOL, AND SHELTER FOR HORSES AND CARRIAGES FOR DISTANT PARISHIONERS.

MR. BANISTER F. FLETCHER, ARCHITECT.

Royal Academy Exhibition, 1894